TECHNICAL REPORT

Prepared for the Government of Manitoba
Livestock Stewardship Panel

April 2001

101-04787/

PREFACE

In June 2000 the Government of Manitoba appointed the Livestock Stewardship Panel with a mandate to seek the views of Manitobans on the expansion of the livestock industry in Manitoba. The Panel's report, entitled *Sustainable Livestock Development: Finding Common Ground,* was released by the Government of Manitoba in January 2001.

The Panel relied on the expertise of many individuals and organizations in the preparation of its report. Two such individuals who provided valuable analytical and scientific assistance were Heather Gregory, Pivotal Plus Consulting Ltd, and Dr Ross Bulley, retired Professor of Biosystems Engineering at the University of Manitoba. This technical document contains some of the background material prepared for the Panel by these two individuals. The material presented here is their work, and the Panel, by releasing this report, does not necessarily endorse all of the analysis and conclusions.

The Livestock Stewardship Panel extends its sincere gratitude to Ms. Gregory and Dr. Bulley for their work and valued professional advice.

Ed Tyrchniewicz **Nick Carter** **John Whitaker**

April 2001

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ECONOMIC BACKGROUND ON PORK

Heather Gregory, Pivotal Plus Consulting Ltd.

1. Overview of World Situation

1.1 World Pork Production

The largest pork producer in the world is China (see Table 1) followed by the US and Germany. About 85% of China's hogs are raised on small family farms and the high population density hampers the establishment of commercial sized operations. The European Union is more than self-sufficient in pork. Likewise, over the last five years, the US has evolved from a net importer of pork to a net exporter. Canada ranks 10th on the list of pork producing countries. Canada has experienced a dramatic growth in production, increasing from 1.28 million tonnes in 1995 to 1.62 million tonnes in 2000. Most of this expansion has occurred in western Canada.

The European Union

The EU is more than self-sufficient in pork. A large volume of product is traded between member countries. The Danish pork industry is one of the most successful in the world, exporting about 80% of its pork to mainly other countries in the EU. The strategy of the Danish industry has been to focus on product competitiveness. One of its main strengths has been the vertical coordination of its industry through its cooperative structure. This structure allows the efficient transmission of consumer's demands back to farmers and allows for identity preservation. Denmark also has viewed training of the work force as a key factor. Similar to Denmark, the hog industry in the Netherlands has become more concentrated. Approximately 75% of the production in the Netherlands is exported to other member countries. A major outbreak of swine fever in 1997 reduced the swine herd. Concerns over manure disposal have pushed the government to finance a retirement of farmers. This will reduce pig numbers in the future. Major growth areas for pork production are Spain and France.

As of August 2000, the European Commission has banned exports of live pigs and hog semen from England due to an outbreak of highly contagious swine fever. This is the first time the disease has appeared in Britain in fourteen years. The fever was discovered in a 3,500 head herd that was supplied with hogs from a major firm that also supplies several large farms in other counties. This will further negatively impact the British meat industry.

People's Republic of China

Despite China's dominant position in the world, the growing population is a major factor accounting for approximately a 3% increase in demand for pork in 2000. China's growing economy and urban middle-class have increased demand for high quality pork and Western-style cuts. As about 85% of China's hogs are produced on small family

Table 1: Top Twelve Producing Countries, Pork Production 1995, 1999 & 2000

Country	1995	1999 Preliminary	2000 Estimate
	Thousands of Tonnes		
China	36,484	39,250	40,500
US	8,396	8,758	8,473
Germany	3,604	4,110	4,080
Spain	2,175	2,802	2,822
France	2,145	2,386	2,338
Former Soviet Union	2,672	2,200	2,205
Denmark	1,457	1,658	1,658
Netherlands	1,623	1,706	1,650
Poland	1,580	1,700	1,636
Canada	1,276	1,485	1,620
Italy	1,345	1,470	1,470
Japan	1,322	1,280	1,275
Total	*74,680*	*80,104*	*81,216*

Source: USDA Foreign Agricultural Service, March 24, 2000.

farms (78% of the producers have less than 90 pigs) and the high population density hampers the establishment of commercial sized operations, increased imports are expected. The granting of permanent normal trading relations (PNTR) status to China could provide potential benefits to the pork sector. As of mid-August China has started to back off its commitment to lower and eliminate tariffs. This could jeopardize its application to the WTO. Under the US/China bilateral accord tariffs on US frozen pork would decline from 20% in 2000 to 12% by 2004, should China join the WTO. The US industry believes that this would allow them to satisfy this growing market demand.

Latin America

Most of the hog production in Brazil is located in the southern states of Rio Grande Do Sul and Santa Catarina. Most new investment is being made in state of the art technology and design. Some investment is also occurring in the central-west region close to the surplus grain/oilseed production. The western states provide financial incentives to pork processors using rebates and preferential taxes.

Argentina seems poised for expansion but long-term growth will depend on inflation rates and the willingness of investors to finance development given the lack of a stable investment climate.

In Chile, Super Pollo, a major poultry company, is investing in world class hog production facilities. This firm has built state of the art facilities and has contracted with North American specialists in feed and genetics. A major factor affecting the long-term cost competitiveness of the industry may be the small amount of grain grown in the country and the limited arable land base.

The US

The US has evolved over the last few years from being a net importer of pork to a net exporter of pork. With the major restructuring that has occurred within the industry and the on-going development of vertical integration and stronger linkages between producer and consumer, the US has become a lower cost producer. In the future, consumer demand will place further emphasis on improved meat quality and the reduction in drugs and residues. Recent reaction to larger operations has resulted in limited opportunities for corporate producers to expand as they face huge problems regarding waste management, water availability and limited labor. Some areas in the mid-west have less than 2% unemployment.

Canada

Canada has experienced a dramatic growth in its pork production. Production increased from 1.28 million tonnes in 1995 to 1.62 million tonnes in 2000, a 26.5% increase over the six years. Most of this expansion has occurred in Western Canada due to regulatory changes and declining transportation costs associated with the elimination of the Western Grain Transportation Act (WGTA).Hog trade between Canada and the US dominates Canadian export sales. However, exports also move to Japan, Korea and Australia.

1.2 World Pork Trade

Global pork exports increased 13% in 1999 to 3.1 million tonnes as stronger import demand occurred in Korea, Japan, the United States and Mexico. For 2000, forecasters expect minimal growth as the strengthening Asian import demand is unlikely to offset lower import demand from Russia. Canadian, American and Brazilian pork exports are projected to increase while EU exports are expected to decline by 5%. The decline by the EU is related to reduced use of subsidies. They extensively used subsidies to expand export sales with 1999 having a year-over-year gain of 30%.

Total pork imports for selected countries increased 16% in 1999 to reach 2.2 million tonnes. Korean and Japanese demand produced the strongest gains with recovery of these economies. Strong imports in the US and Mexico also helped to offset weaker imports in Eastern Europe. Total pork imports for 2000 are expected to decrease 1% due to lower import demand from Russia.

1.3 Per Capita Consumption

Table 2 indicates the latest per capita consumption projections for the year 2000. Pork consumption in many countries has stayed static. In Russia, the decline is related to the depressed economy. Countries such as Spain, Brazil, Italy, Canada and China have recorded growth in per capita consumption.

Table 2: Per Capita Pork Consumption for Selected Countries, 1995 to 2000

Country	1995	1996	1997	1998	1999	2000	% change (2000/ 1995)
	Kg Per Person						
Spain	54.0	56.3	57.8	60.7	64.0	64.0	+18.5
Germany	54.8	54.7	53.2	55.9	58.8	59.1	+7.8
Netherlands	44.2	44.3	42.9	43.9	43.7	43.5	-1.6
France	35.8	34.8	35.3	38.1	38.4	38.2	+6.7
UK	22.8	23.5	24.1	25.9	25.0	24.2	+6.1
Italy	33.6	35.3	34.8	35.9	36.3	36.3	+8.0
Canada	31.9	29.9	29.4	31.2	32.0	34.3	+7.5
US	30.6	28.7	28.5	30.7	31.7	30.3	-1.0
Brazil	8.7	9.4	8.9	9.5	9.9	10.7	+23.0
Australia	19.4	18.1	18.5	19.4	19.1	17.7	-8.8
Japan	16.7	16.9	16.5	16.6	17.0	16.9	+1.2
China	30.1	25.8	29.2	31.3	31.4	32.2	+7.0
Russia	17.4	14.5	14.0	12.8	12.6	12.6	-25.9
Poland	38.6	41.2	34.4	38.3	39.6	38.7	+0.3
Hungary	39.3	38.5	40.6	36.6	42.1	42.0	+6.9

Source: USDA, Foreign Agricultural Service, March 24, 2000.

1.4 Where will pork be produced and what will limit production?

There are a number of factors influencing where pigs are raised. There will be increasing emphasis on the environment and animal welfare. Table 3 provides a useful perspective.

A major concern in the US is water quality and the potential that slaughter capacity may restrict expansion of the industry. The US has realized many efficiencies associated with vertical integration of production/processing and the adoption of new technologies. Although Brazil has the third largest pig inventory, the presence of Foot & Mouth Disease may restrict exports. Lack of basic infrastructure and transportation to distant markets also impact sales.

Taiwan reported Foot & Mouth Disease in 1997. This disease lead to the destruction of over 4 million hogs and the loss of export sales. Since late April, Japan has reported several cases of Foot & Mouth (a first since 1908). Outbreaks also have occurred in South Korea. Japan has banned imports of beef and pork from South Korea until it can demonstrate that it has eradicated the disease. Industry analysts suggest that because Korean authorities have not been able to identify the source of the contamination, they cannot prevent re-occurrence. These outbreaks should boost demand for imported pork from other countries such as the US and Canada.
In addition, as of January 2000, the two-year grace period for the Chemical Oxygen Demand standard for pig farm waste water has ended in Taiwan. Hog producers must now comply with more stringent environmental controls. This is expected to force many of the remaining small and less efficient farmers out of production. Taiwan's Board of

Foreign Trade announced in January, 2000 that the US and non-US quotas for pork variety meats and pork bellies would be merged into global quotas and open to all WTO members. The US, Canada, Australia, NZ, Japan, Korea and Sweden meet the quarantine and food safety requirements. It will take some time for Denmark to achieve this status.

In Europe, two factors will play a key role in the future development---animal welfare and environment. The EU is expected to introduce further restrictions on pig production techniques in the name of animal welfare. A scientific report has been tabled with the Source: Western Hog Journal, Special Edition, Banff Pork Seminar 2000, page 17. Summary of presentation made by Nick Giordano, National Pork Producers Council. European Commission for evaluation. One should not expect EU countries to accept imports of pork produced according to lower welfare standards.

The trend towards liberalization of world markets will translate into more access and less protection for individual countries. The next century will see increased emphasis on the environment and animal welfare. Coupled with these is a growing concern from the consumer on food safety due to salmonella, e.coli and other contaminates. Traceability of the product from the farm to the consumer will be exploited as meat marketers seek to differentiate their product in the marketplace.

1.5 World Pork Prices

Table 4 indicates world pork prices as published by Canada Pork International in their July 11th edition of export information. To convert a live weight into dressed weight, one could assume a dressing percentage of 79%. In some countries, this dressing percentage may be substantially less. The estimated price in $CDN for 100 kg in Italy, Hungary, Poland and Brazil would therefore be $179.39, $144.76, $143.48, and $132.48/100 kg, respectively.

1.6 Cost Comparisons of Selected Regions/Countries

The George Morris Centre recently completed a study on the advantages that Western Canada has over several other locations with respect to pork production. Several sizes of operations were compared including a 180 sow farrow-to-finish operation with a single site, and a 600, 1,200 and 3,000 sow farrow-to-finish operation located on three sites. The operations were assumed to have the same technologies and operate an all in/all out production system. Although the costs took into account labor, rations, feed costs, depreciation costs and interest costs, they did not include marketing costs, veterinary medicine or manure disposal costs as these expenses were viewed as largely unique to the farm operation. Table 5 summarizes the costs on a per market hog basis. It is interesting to note that the Centre concluded that subsidies alone could not explain the success the Netherlands and Denmark have had in export sales. Analysts concluded that "the highly integrated (through cooperatives) nature of the Danish industry has lead to coordination or system efficiencies that have not yet been realized in North America. With the continued integration in North America, Canada may be gaining on Denmark in this

Table 3: Factors Limiting Hog Production

Factor	*US*	*Russia*	*Denmark*	*Canada*	*Poland*	*Netherlands*
Land			X			X
Capital		X			X	
Feed Grains		X				X
Environment	X		X	X		X
Disease		X			X	X
On-farm Technology		X			X	
Processing Technology		X			X	
Distribution		X				
Economic/ Political Stability		X				
Animal Rights			X			X

Factor	*China*	*Taiwan*	*Mexico*	*Korea*	*Japan*	*Brazil*
Land		X		X	X	
Capital	X			X		X
Feed Grains	X	X	X	X	X	
Environment		X		X	X	
Disease	X	X		X		X
On-farm Technology	X		X			
Processing Technology	X		X	X	X	X
Distribution	X		X			X
Economic/ Political Stability			?	X		X
Animal Rights						

respect as well as having lower production costs." Canada although it is gaining in production efficiencies still has to better coordinate the marketing of its pork.

2. Overview of Canadian Situation

2.1 Canadian Hog Inventories

Table 6 indicates the latest statistics related to hogs on farms in Canada. Manitoba had a modest decline in total number of hogs and pigs on farms with a 1.5% reduction. Manitoba producers continue to react optimistically to the rebound in market prices and increased their breeding herd inventory by almost 7%. Farrowing intentions in Manitoba for January to March were up almost 18% but producers are suggesting little, if any increase for the April to June period. Canadian pork production for the first half of 2000 could be up 5 to 6% over the previous year. In terms of major producing provinces,

Manitoba has approximately 15.2% of total inventories while Quebec and Ontario have 30.1% and 27.9%, respectively.

Table 4: World Pork Prices, July 2000

Country	Price $US/100 kg	Price $CDN/100 kg
Austria	138.67	205.23
Belgium	168.96	251.54
Denmark	128.17	189.69
France	139.21	206.03
Germany	142.47	210.85
Italy (live weight)	96.97	143.51
Netherlands	119.21	176.43
Spain	155.43	230.03
Sweden	140.57	208.04
UK	149.40	221.11
Hungary (live weight)	77.27	114.36
Poland (live weight)	76.59	113.35
US	134.27	198.71
Canada	119.05	176.19
Mexico	142.76	211.28
Brazil (live weight)	70.72	104.66
Australia	162.05	239.83

Source: Canada Pork International, Export Information 2000-31, July 11, 2000.

Table 5: Total Costs Per Market Hog For Selected Regions/Countries (Dollars)

Region/ Country	Size of Production Unit			
	180 Sow	600 Sow	1200 Sow	3000 Sow
US West Corn Belt	84.86	79.71	76.64	72.87
US East Corn Belt	89.41	83.94	80.13	75.49
US South East	92.35	86.09	82.96	78.88
US Mountain	97.48	91.09	87.85	83.66
Maritimes	106.15	96.92	94.00	89.26
Quebec	102.34	93.00	89.81	84.86
Ontario	92.57	84.24	79.28	73.22
Eastern Prairies	80.78	71.16	68.48	63.82
Western Prairies	89.02	80.64	77.76	72.63
Netherlands	185.82	154.23	150.24	143.48
Denmark	180.58	149.82	145.28	138.03

Source: Western Hog Journal, Special Edition, Banff Pork Seminar 2000, page 24. Summary of presentation made by Larry Martin, George Morris Centre.

2.2 Size of Hog Operations

As shown in Figures 1 and 2, the industry has become more concentrated with a decline in the number of farms and an increase in the number of pigs per farm. The number of hog farms in Canada has declined steadily over the years while herd size has increased from 446 head to 828 head.

2.3 Canadian Hog Slaughter

Recent expansion in production and slaughter capacity is expected to lead to a 5% increase in the total hog slaughter from 18.9 million head in 1999 to 19.9 million head in 2000. In absence of any strikes or lockouts in the packing industry, hog slaughter is expected to increase a further 8% in 2001 to 21.6 million head. Accompanying this increase in domestic slaughter, the export of slaughter hogs is forecast to decline in 2000 and 2001. Data for the first quarter of 2000 supports this since Canadian live slaughter hog exports were 15% less than the same period in 1999.

Weanling exports to the US were 20% higher in the first quarter at 543,000 head. Analysts are expecting weanling exports to increase further as many US farrow-to-finish operations are becoming finishing only operations due to cheap feed grains and lower labor costs. To keep the barns full, the US operators are importing weanlings from Canada. This shift in the composition of live hog imports from slaughter hogs to weanlings suggests a transition in US-Canada trade and may indicate a growing trend towards cross-border linkages between US and Canadian hog producers.

Effective October 6, 1999, Canada implemented a revised Health of Animal Regulation which will facilitate the importation of US slaughter hogs. These regulations now allow US slaughter hogs to be brought in from 38 states considered to be free of pseudorabies and brucellosis (those states with Stage IV and V status). In addition, inspection of hogs can now be done up to seven days prior to shipment by a US veterinarian. Plant employees at the Canadian packing plant can now unload the shipment without a Canadian veterinarian present.

In terms of concentration of the processing industry, it is estimated that the top four processors will account for 68% of the average daily hog slaughter in 2000 compared to 51% in 1993. Maple Leaf does almost one-third of the hog processing in Canada.

2.4 Canadian Exports

Table 8 summarizes the export numbers for 1998 and 1999. Sales in 1999 to the US, Japan, Korea, Mexico and Australia were significantly ahead of the previous year. The US continues to be Canada's number one customer, taking about 60% of Canada's total exports.

Over 40% of Canada's hog production is exported. This percentage will continue to increase as production rises and the only source of growth in North American

consumption is related to population growth. The export market will therefore be the source of future growth. The implementation of the 1995 WTO agreement has reduced tariffs and non-tariff barriers, particularly in Asia. Our success abroad will continue to focus on providing high quality pork and pork products that satisfy consumers' demands. The global marketplace will continue to be very competitive with consumers becoming more concerned about food safety. The hog industry views its Canadian Quality Assurance Program as a key in gaining the competitive edge in new markets and increasing market share in existing markets.

Table 6: Canadian Hog Inventories, April 1, 1999 and 2000

	BC	AB	SK	MB	ONT	QUE	CANADA
Total Hogs & Pigs on Farms							
1999	146.8	1780.8	903.0	1884.1	3347.5	3789.6	12227.3
2000	142.6	1742.0	993.9	**1856.1**	3404.1	3667.0	12186.0
% change	-2.9	-2.2	+10.0	-1.5	+1.7	-3.3	-0.4
Female Breeding Herd							
1999	18.8	172.8	91.5	232.9	326.9	375.3	1252.7
2000	19.3	183.5	97.5	248.3	333.0	365.0	1281.4
% change	+2.7	+6.2	+6.6	+6.6	+1.9	-2.8	+2.3
Market Hogs							
1999	126.7	1599.0	805.9	1640.8	3006.3	3403.9	10921.7
2000	122.3	1549.7	891.1	1598.0	3057.7	3292.6	10854.6
% change	-3.8	-3.1	+10.6	-2.6	+1.7	-3.3	-0.6
Farrowing Intentions January to March							
1999	9.3	80.0	41.8	117.6	164.7	208.7	640.2
2000	10.0	94.1	45.3	138.7	172.6	184.8	663.6
% change	+7.5	+17.6	+8.4	+17.9	+4.8	-11.5	+3.7
Farrowing Intentions April to June							
1999	10.0	92.8	43.3	141.2	161.5	174.0	640.9
2000	9.9	93.4	47.0	140.0	165.0	183.0	656.5
% change	-1.0	+0.6	+8.5	-1.0	+2.2	+5.2	+2.4

Source: Statistics Canada.

Figure 1: Number of Canadian Hog Farms, January 1

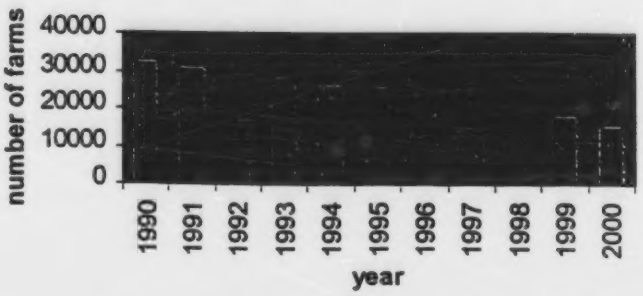


Figure 2: Average Number of Hogs, January 1

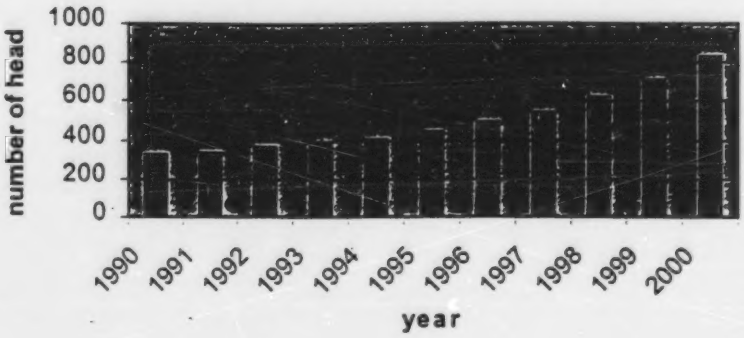


Table 7: Number of Hogs Slaughtered by Region/Province, 1997-99

Region/Province	1997	1998	1999
	000's of head		
Atlantic Region	560.9	608.4	636.4
Quebec	5,751.7	6,252.3	6,766.5
Ontario	3,485.7	4,011.7	4,692.4
Manitoba	1,878.0	2,341.8	2,699.0
Saskatchewan	1,181.3	1,343.7	1,336.9
Alberta	2,264.4	2,142.0	2,496.1
BC	262.6	291.2	304.0
Canada	15,384.6	16,991.1	18,931.3

Source: Statistics Canada.

Table 8: Canadian Exports of Pork, 1998 and 1999

Country	Quantity (Tonnes)		Value ($ Million)	
	1998	1999	1998	1999
US	232,596	289,691	652.0	774.9
Japan	64,859	84,145	266.9	332.8
China/Hong Kong	28,962	27,166	32.8	19.9
South Korea	3,255	18,915	9.2	30.2
Mexico	3,216	18,137	2.5	17.0
Australia	5,952	13,219	17.7	36.2
Taiwan	4,009	12,189	3.9	14.6
Cuba	9,724	8,406	18.1	15.6
New Zealand	7,036	7,619	16.8	17.7
Philippines	5,381	7,648	4.6	6.4

Source: Statistics Canada.

2.5 Market Outlook

Table 9 provides details on the hog and pork supply situation in Canada for 1999 to 2005. Because of higher pork prices, per capita consumption of pork in Canada may decline marginally in 2001. This decrease will be offset by increased population. Pork production will increase 7% between 1999 and when it peaks in 2002. Production in 2005 is projected to be 3.4% higher than the 1999 level. Pork exports are expected to increase 8% between 1999 and 2002 and trend close to 199 volumes by 2005. Live hog exports of weanlings are expected to remain strong while exports of slaughter hogs are expected to decline in 2000-2001.

Canadian slaughter capacity will continue to increase at least until 2002 as plants continue to upgrade and expand their capacities. Packing plants in Canada have been successful in realizing lower labor costs through contract negotiations. Packers have also been increasing the portion of hogs feed under contract. Contract hog feeding has been driven by the need for producers and packers to reduce financial risk. Contracting and vertical integration will continue to drive the industry. In the US contracting represents more than 50% of the hogs slaughtered as large producers look to bolster financial security and packers try to better coordinate supplies to improve capacity utilization. Integration has been sparked by demand for uniform quality and food safety issues. The question remains if the small producer will be able to also take advantage of contracting opportunities and, if not, can he survive over the long term. In the US, dwindling cash markets have fostered concerns about potential packer price manipulation and prompted price reporting legislation.

Producers have tried to capture some of the value further down the system through various producer-owned cooperatives. This is in direct response to concerns over the consolidation of the packing sector. These cooperatives could own their own slaughter/processing facilities, invest in existing facilities or make arrangements with existing processors, retailers and exporters to supply pork to meet their market needs. The development of one or more brands exclusively owned by the cooperative would also be a possibility.

Given limited increases in North American demand, both the US and Canada will become increasingly focused on the export market. The return of Japan and Korea to the marketplace is a positive move for the longer term as these economies strengthen.

In terms of availability of feed grains, Canadian coarse grain exports are expected to remain relatively static for the next five years with the small increases in production being used to feed the ever-increasing livestock population.

Table 9: Hog and Pork Supply/Disposition, 1999-2005

	1999	2000	2001	2002	2003	2004	2005
	Thousands of Head						
Hog inventories	12800	12572	12749	13041	13148	12782	12752
Supply-Disposition							
Hog marketings							
East	12484	12463	12490	12563	12346	11740	11305
West	7984	7399	7849	8580	9058	8599	8886
Total	20468	19863	20339	21143	21404	20339	20190
Slaughter							
East	11557	11458	11470	11454	11313	10998	10718
West	6438	6601	7030	7430	7371	7211	7255
Total	17996	18060	18500	18885	18684	18209	17973
Exports (slaughter hogs)							
East	927	1005	1021	1108	1033	742	587
West	1545	798	819	1150	1688	1388	1630
Total	2472	1803	1839	2258	2720	2130	2217
Exports (weanlings)							
East	491	463	459	457	481	503	539
West	678	682	697	713	730	745	776
Total	1169	1145	1157	1170	1211	1249	1316
Pork supply-Disposition			*Thousands of Tonnes*				
Production	1489	1502	1547	1589	1581	1550	1540
Imports	51	53	55	57	59	61	63
Disappearance	852	862	876	901	919	909	902
Waste	153	155	159	164	163	160	159
Exports	537	541	571	581	557	549	548
Ending Stocks	31	29	24	24	25	19	13
Wholesale Pork Price ($/kg)	2.86	3.06	3.02	2.80	2.65	2.91	3.12
Retail Pork Price ($/kg)	6.44	6.68	6.68	6.52	6.41	6.76	7.06
Hog Price Index 100 Ontario ($/ckg)	146	160	163	148	134	151	164

Source: Statistics Canada, Winter 1999 Medium Term Forecast and Conference Board of Canada, Extrapolation of Winter 1999 Medium Term Forecast

3. Manitoba Situation

3.1 Manitoba Production/Inventories

Between 1990 and 2000, the number of hog farms has declined by more than 50% from 3,150 to 1,450 while the average number of pigs per farm has more than tripled increasing from 388 head to 1,290 head. Manitoba Agriculture estimates that about 13% of commercial hog operations produce weanlings only, 40% are farrow-to-finish operations and 47% are feeder operations. The industry used $247 million of feed and paid $65 million in labor expenses in 1999.

Manitoba is Canada's third largest hog-producing province with almost 21% of national production and almost 4% of the total North American production in 1999. Hog production in the province has increased more than fivefold since 1975. In the past four years, the average annual rate of increase has been 12%. Production in Manitoba was 3.2 million hogs in 1996. By 1999, this had increased to 4.8 million hogs. The total value of hog production was $466 million in 1996, $517 million in 1997, $422 million in 1998 and $476 million in 1999.

3.2 Manitoba Slaughter

There are four major and two minor federally-inspected plants and 17 provincially-inspected plants in Manitoba. Manitoba slaughter volumes have increased from 1.9 million head in 1996 to 3.1 million head in 1999. About 515,000 pigs originated from Alberta, Saskatchewan and Ontario. The processing industry has continued to expand with current capacity of 5 60 6 million head, depending on whether or not double shifting occurs. J.M. Schneider has announced it intends some time in the future to expand its slaughter/processing capacity. In effect, with this expansion, Manitoba would have the potential to process 10 million hogs, only about half of that is produced within the province now. Packers will be able to draw on sources in Saskatchewan, Alberta and the US but this will still result in a shortfall in hogs unless production expands in the prairie region.

3.3 Manitoba Exports

In 1999, Manitoba had exported over 2.2 million hogs with a value of $165 million. Approximately 60% of these live hog exports in 1999 were weanling pigs. Most of the slaughter hogs went to plants in South Dakota, Iowa, Wisconsin and North Dakota. The weanlings primarily were sold to feeder operations located in Iowa, Minnesota, Nebraska and South Dakota.

Manitobans consumed only about 11% of the pork produced in the province. Manitoba Agriculture estimated that in 1999 60% of the pork produced by Manitoba plants was shipped to other provinces. Pork exports in 1999 were 88 million kg valued at $240 million and were sold to twenty-three countries with most exports going to the US and Japan.

Table 10: Summary of Manitoba Hog and Pork Sector

	1996	1997	1998	1999	% CHANGE
Hog Farms	2,064	1,930	1,800	1,630	-9
Hogs on Farms (000's) Jan 1					
Sow & Gilts	181.2	201.5	215.9	234.1	+8
% of Canada	15.9	17.3	17.2	18.4	
Boars	10.2	10.1	10.3	10.3	nc
Market Hogs	1,622.3	1,597.9	1,772.4	1,672.4	-6
Total Hogs	1,813.7	1,809.5	1,998.6	1,816.8	-4
% of Canada	15.7	15.5	16.1	15.5	
Hog Production (000's)[i]	3,164	3,530	4,060	4,750	+17
% of Canada	18.0	18.5	18.9	20.7	
Annual Production Growth Rate	5.9	11.6	14.7	17.0	
Value of Hog Production ($ mln)	466	517	422	476	+13
Hog Cash Receipts ($ mln)	448.5	468.6	396.4	481.7	+22
Average Index 100 Hog Price ($/100kg)	183	182	121	125	+3
Average Index	108.9	108.5	108.8	109.8	+1
Hog Slaughter					
Inspected in Manitoba (000's)	1938.0	2075.8	2820.0	3073.0	+9
% of Canada	13.0	13.7	17.2	16.4	
Mb- origin Slaughter in Canada (000's)	1921.2	2071.9	2260.0	2566.3	+14
% of Canada	12.8	13.7	13.5	13.7	
Pork Production [ii] (000's tonnes)	160	175	245	275	+12
Estimated Value of Processing ($ mln)	460	550	650	750	+15
Exports Hogs (000's)	1285.6	1347.1	1660.3	2284.5	+38
($ mln)	154.8	164.0	155.8	165.3	+6
Pork ($ mln)	77.9	154.4	197.3	239.9	+22
Imports Hogs ($ mln)	0.3	0.4	0.4	0.3	-40
Pork ($mln)	11.7	17.0	20.7	29.2	+41

Source: Manitoba Agriculture and Food, 1999 Manitoba Livestock Industry Profiles.

ECONOMIC BACKGROUND ON BEEF

Heather Gregory, Pivotal Plus Consulting Ltd.

1. Overview of World Situation

1.1 World Beef Production

The largest beef producer in the world is the US (see Table 1) followed by Brazil and China. China is self-sufficient in beef and exports minimal amounts. Bovine Spongiform Encephalopthy (BSE) has negatively impacted production and trade in the European Union. Canada ranks 11th on the list of beef producing countries with production in the 1.2 million tonne range.

The European Union

Still affected by the BSE crisis that erupted in March 1996, EU cattle inventories continued to fall in 1999 and 2000. BSE continues to be an important health issue and although the EU Commission decided to lift the ban on British beef, France continues to refuse the product. US beef from cattle produced with growth hormones is banned in the EU and the US has imposed trade sanctions against the EU to counteract the impact on trade. Despite heavier slaughter weights in 2000, EU beef production is expected to decline 1% in 2000 to 67.4 million tonnes.

People's Republic of China

China's beef production increased 6% from 1998 to 1999. A further 6% is expected in 2000. China tends to be self-sufficient in beef with minimal imports.

Latin America

Argentine cattle inventories have stabilized from the liquidation that began in 1993. Although cattle slaughter is expected to rise slightly, beef production is forecast to fall 3% to 2.8 million tonnes due to lighter slaughter weights. As of mid-August of 2000, Argentina has suspended beef exports to Canada, the US, Central America, the Caribbean and Venezuela to protect the industry from an outbreak of Foot & Mouth Disease in one northern province. Argentina two months earlier had just earned a clean bill of health for its stock as free of the disease. This could now compromise future exports.

Brazil's cattle inventories are expected to stabilize in 2000 with cattle slaughter rising moderately. Beef production is expected to be 6.3 million tonnes, up 4%. Beef production is being driven by the export market. Brazil has undertaken an extensive campaign to eradicate Foot & Mouth Disease (FMD) by 2004. They have already applied to the Technical Committee of the Office of International Epizootics (OIE) to approve one region in the country as being FMD-free. They are also actively pursuing

USDA recognition for FMD-free status for the Rio Grande do Sul and Santa Catarina states.

United States

Despite continuing inventory declines and near record heifer slaughter over the past three years, cattle feedlot placements remain unusually large. Slaughter weights are likely to remain at record levels as demand for higher quality beef of consistent quality remains strong. US beef production is still expected to decline slightly in 2000.

Canada

The Canadian cattle herd liquidation will continue in 2000 but slaughter is expected to rise slightly reflecting sharply lower slaughter cattle exports and rising feeder cattle imports from the US under the Northwest Cattle Project.

Expanded slaughter and chilling capacity in western Canada plus reduced beef inventories are major factors driving the trend in lower cattle exports.

Table 1: Top Twelve Beef Producing Countries: Production, 1995, 1999 & 2000

Country	1995	1999	2000 Estimate
	Thousands of Tonnes		
United States	11,585	12,124	12,023
Brazil	6,080	6,050	6,300
China	4,154	5,100	5,400
Former Soviet Union	4,468	2,991	2,870
Argentina	2,600	2,900	2,800
Mexico	1,850	1,860	1,900
Australia	1,717	2,004	1,870
India	1,100	1,660	1,700
France	1,648	1,567	1,590
Germany	1,407	1,353	1,342
Canada	928	1,225	1,240
Italy	1,181	1,150	1,160
Total beef production*	*47,958*	*49,169*	*49,349*

*Selected countries
Source: USDA Foreign Agricultural Service, March 24, 2000.

1.2 World Beef Trade

Trade in beef ranges between 4.5 and 5.7 million tonnes annually. The major exporting countries are Australia, the US, Brazil and Canada. Australia and the US each export approximately 1.0 to 1.2 million tonnes annually, while Brazil and Canada each export 0.5 to 0.6 million tonnes annually.

Beef exports among the major countries are expected to rise from 5.66 million tonnes to 5.72 million tonnes in 2000. EU beef exports are expected to decline sharply as no new Russian food aid package is planned for 2000. Export growth is expected to be strongest in Brazil and Argentina as devaluation of the Brazilian Real and low prices make these countries extremely competitive.

Major importing countries are the US, Japan, the Former Soviet Union, Canada and Mexico. Imports to the US and Canada tend to be manufacturing beef. Mexican trade is the high quality cuts for the tourist trade.

US imports of beef are expected to rise 5% in 2000 due to increased imports of manufacturing grade beef and higher quality cuts. Canada remains the main exporter to the US. Canada tends to import lower quality product from Uruguay and Argentina for ground beef. Mexican imports are tied to the economic situation. A health economy translates into more imports. The US continues to be Mexico's primary beef supplier as high quality US cuts continue to be favored by the upper income class and tourist sector.

Stocks of beef in Japan were higher at the beginning of 2000 due to increased imports in 1999, higher domestic production and slightly reduced consumption. The forecast is for Japan to reduce its imports of beef as it draws down these inventories.

Although imports to Korea are increasing, Korea did not meet its WTO minimum purchase commitment for 1999 and is not expected to meet its 2000 commitment. Korea's retail distribution system continues to discriminate against beef imports by requiring that imported beef be sold through restrictive distribution channels and only in specialized stores. It is anticipated that a WTO panel will rule in the spring of 2000 on the US complaint about lack of access to this market.

1.3 Per Capita Consumption

Table 2 provides an historical perspective on per capita beef and veal consumption. Some countries such as Canada and the US do not have dramatic changes from one year to the next. Other countries such as Argentina and New Zealand can have more dramatic swings in consumption patterns.

2. The US Situation

2.1 US Cattle Inventories

Cattle inventories in the US have been declining since 1996. In spite of the inventory declines and near record heifer slaughter over the past three years, feedlot placements remain high, including placements at heavy weights. All cattle and calves as of January 1, 2000 totaled 98 million head, down 1% from the previous year and the fourth year of decline from the 1996 peak of 103.5 million head. Beef cow replacement heifers and beef cows were also slightly down. Industry analysts suggest that producers are now

starting to show interest in stabilizing their herd numbers. If this occurs, supplies of beef will tighten over the next 2 to 4 years.

Table 2: Per Capita Beef and Veal Consumption, 1995 to 2000

Country	1995	1996	1997	1998	1999	2000	% change 2000/1995
	Kg Per Person						
Argentina	59.6	60.0	71.4	64.0	70.2	65.4	+9.7
Uruguay	62.5	61.7	61.3	60.0	60.4	60.0	-4.0
US	44.6	44.8	43.9	44.6	45.3	44.9	+0.7
New Zealand	28.5	36.1	39.0	38.6	34.1	36.5	+28.1
Australia	36.0	39.2	42.8	38.5	40.2	35.2	-2.3
Brazil	36.2	36.6	35.1	34.5	32.3	32.7	-9.7
Canada	32.8	31.7	31.9	31.7	32.1	31.9	-2.8
France	27.3	25.2	25.9	26.6	26.8	26.8	-1.8
Italy	26.7	25.0	25.3	25.9	26.3	26.3	-1.5
Czech	30.6	30.3	26.8	25.7	24.5	24.6	-19.7
Belgium	21.8	22.2	22.7	21.0	21.9	21.7	-0.5
Denmark	20.1	20.5	20.7	21.2	21.3	21.2	+5.5
Mexico	20.3	19.8	20.0	20.5	21.0	21.1	+3.9
China	3.4	2.9	3.6	3.8	4.1	4.3	+26.5
Japan	12.1	11.5	11.7	11.8	11.7	11.7	-3.3
Taiwan	3.4	3.0	3.7	4.0	4.5	4.7	+38.2
Egypt	8.3	8.4	8.7	8.2	7.9	7.8	-6.0
India	1.0	0.8	1.3	1.4	1.4	1.3	+30

Source: USDA Foreign Agricultural Service, March 24, 2000.

Table 3: US Cattle Inventory, January 1, 1999 and 2000

Inventory	1999	2000	% change
	Thousands of Head		
Total Cattle & Calves	99,115	98,048	-1.1
Cows & Heifers that calved	42,878	42,734	-0.3
Beef Cows	33,475	33,546	-0.6
Milk Cows	9,133	9,188	0.6
Heifers 500 lb +	19,774	19,528	-1.2
For beef cow replacement	5,535	5,530	-0.1
For milk cow replacement	4,069	3,954	-2.8
Other heifers	10,170	10,045	-1.2
Steers 500 lb +	16,891	16,652	-1.4
Bulls 500 lb +	2,281	2,294	0.6
Calves under 500 lb	17,290	16,840	-2.6
Calf Crop Jan-June	28,500	na	
July-Dec	10,210	na	

Source: USDA, ERS Livestock, Dairy & Poultry Outlook, Feb. 29, 2000.

2.2 US Beef Processors

The top five beef processors in the US now account for 74.3% of the total commercial cattle slaughter. They have a combined capacity of 99,400 head/week in their 31 plants. The trend over the past year has been to maximize capacity utilization at existing plants and closing those plants that are less economical or out-dated. This past year a total of seven slaughter operations were closed.

Table 3: Top Five US Beef Packers, 1999

Company	Weekly Capacity # Plants	Annual Sales ($ mln)
1. IBP Inc. Dakota City, Nebraska	38,800 / 13	12,849
2. ConAgra Beef Co. Greeley, Colorado	23,000 / 7	6,700
3. Excel Corporation Wichita, Kansas	22,500 / 5	6,400
4. Farmland National Beef Pkg. Co. Kansas City, Missouri	9,000 / 2	2,100
5. Packerland Packing Company Green Bay, Wisconsin	6,100 / 4	1,200

Source: Cattle Buyers Weekly.

2.3 US Trade

The North American cattle and beef markets are becoming increasing integrated as countries shift their resources toward activities that they have a comparative advantage. As a result, trade in both live animals and beef has increased. Mexico has been an important export market for US beef and a source of feeder cattle. US beef does not compete with Mexican-produced beef as Mexican cattle do not grade select or better because of grass finishing.

Trade between the US and Canada is both beef and live cattle. Live cattle have tended to move into western Canada under the Northwest Pilot Project. The future of this project may be subject to review if the North Dakota legislature implements additional restrictions on Canadian cattle by requiring testing for Blue tongue and anaplasmosis. Canada has been designated disease-free of these diseases and has achieved recognition of this status by the OIE and USDA.

2.4 US Beef Outlook

The US Department of Agriculture (USDA) is projecting beef production in 2000 to be almost 25 billion pounds, about 5% less than 1999. Lower production is expected as a

result of lower cattle inventories and record heifer slaughter. As dry conditions in the south force more cattle off grazing programs and into feedlots, the USDA is finding it necessary to constantly revise its estimates.

Table 4 summarizes the USDA's latest forecast for 2000 and 2001. As the beef herd stabilizes in 2001, US beef production will continue to decline in 2001. Modest increases in production in 2002 but lower imports will translate into declining supplies with increases not expected until 2003.

Beef exports in 2000 are expected to be near 1999's record high. The most promising market for US beef will be Korea as the reduction in tariffs continues and consumer demand for beef improves with the economic recovery.

Table 4: USDA Beef Baseline Forecast

Item	1998	1999	2000	2001
	Millions of Pounds			
Beginning Stocks	465	393	370	365
Total Production	25759	26346	24981	23748
Beef Imports	2642	2820	3015	3025
Total Supply	28866	29559	28366	27138
Exports	2171	2376	2310	2250
Ending Stocks	393	370	365	350
Per Capita Consumption (lbs)				
Carcass weight	97.3	98.3	93.3	88.4
Retail weight	68.1	68.8	65.3	61.9
Prices, Choice Steers Neb. (US$/cwt)	61.48	65.56	69.50	69.52

Source: USDA, 2000 Baseline Projections.

3. Canadian Situation

3.1 Canadian and Provincial Beef Inventories

Table 5 indicates the latest statistics available on the number of cattle on farms in Canada. Manitoba had the second smallest decline in the total number of cattle and calves on farms, with a 1.4% reduction. However, on the positive side, farmers are reacting optimistically to improved market prices and have increased the number of beef cows and replacement heifers by 0.7%.

The number of slaughter animals in Alberta has risen reflecting the increased efficiencies and economies of scale that are being achieved by the large feedlots. The results tend to reinforce Manitoba's initiative to concentrate on cow-calf and feeder production and shipping the heavier weight feeders to Alberta for further finishing and slaughter at their state-of-the-art plants.

Table 5: Canadian Beef Inventories, January 1, 1999 and 2000

	BC	AB	SK	MB	ONT	QUE	CANADA
Total Cattle & Calves on Farms							
1999	634.0	5,100.0	2,334.0	1,176.0	2,044.0	1,274.0	12,870.0
2000	612.0	5,105.0	2,250.0	1,160.0	1,995.0	1,231.0	12,654.5
% change	-3.5	NC	-3.6	-1.4	-2.4	-3.4	-1.7
Beef Cows & Replacement Beef Heifers							
1999	283.5	1,905.0	1,214.0	578.0	474.0	238.5	4,770.4
2000	289.0	1,885.0	1,199.0	582.0	460.0	239.0	4,730.5
% change	+1.9	-1.0	-1.2	+0.7	-3.0	+0.2	-0.8
Bulls 1 Year Plus							
1999	14.0	91.0	49.0	24.0	25.0	19.5	227.2
2000	14.0	91.0	51.5	24.5	25.0	19.0	229.6
% change	NC	NC	+5.1	+2.1	NC	-2.6	+1.1
Slaughter Heifers & Steers 1 Year Plus							
1999	33.5	1,130.3	87.0	88.0	337.0	64.0	1,789.6
2000	27.5	1,165.0	70.0	79.0	327.0	58.0	1,773.7
% change	-17.9	+3.1	-19.5	-10.2	-3.0	-9.4	-0.9
Calves Under 1 Year							
1999	192.5	1,833.0	935.0	420.0	633.0	316.0	4,411.8
2000	170.0	1,825.0	883.0	410.0	632.0	310.0	4,310.8
% change	-11.7	-0.4	-5.6	-2.4	-0.2	-1.9	-2.3

Source: Statistics Canada.

3.2 Size of Beef Operations

Figures 1 and 2 indicate the natural trend of declining farm numbers and increasing herd size. It is interesting to note that Alberta had 36,560 farms in 1996 while Ontario had 33,394, Saskatchewan 25,108, Quebec 19,658 and Manitoba fourth with 12,807. Alberta has the largest herd size at 163 head in 1996 compared to 108 in Saskatchewan, 106 in Manitoba, 73 in Quebec and 68 in Ontario.

Figure 1: Number of Cattle Farms

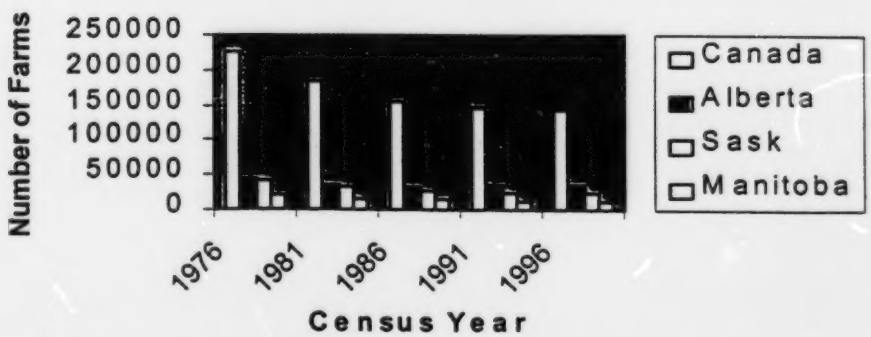
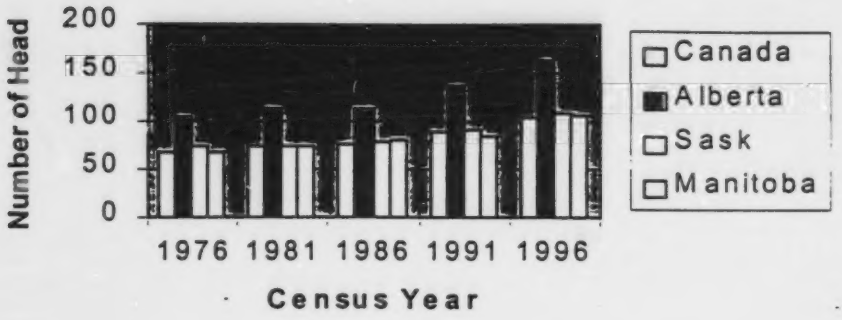


Figure 2: Average Number of Cattle Per Farm



3.3 Canadian Supply/Disposition

Table 6 indicates the supply-disposition of beef cattle and calves for Canada from 1997 to 1999. Domestic slaughterings are up over 5% to about 4 million head despite a reduced supply. This increase has been achieved through increased importation of live cattle from the US and reductions in live cattle exports. In terms of interprovincial movement, live cattle move from Quebec, Manitoba and Saskatchewan into Ontario for feeding/slaughter and from Manitoba, Saskatchewan and BC into Alberta. Alberta accounts for 57% of the total Canadian slaughter.

Table 6: Canadian Cattle and Calves Supply-Disposition, 1997-99

January to December	1997	1998	1999
Supply	Thousands of Head		
1. Starting inventory	13,408.6	13,208.9	12,870.0
2. Calves born	5,360.4	5,242.2	5,141.7
3. Interprovincial imports	1,187.4	1,251.8	1,510.1
4. International imports	43.9	89.1	234.2
5. *Total supply (1+2+3+4)*	20,000.3	19,792.0	19,756.0
Disposition	Thousands of Head		
6. Slaughter	3,630.8	3,768.2	3,970.8
7. Interpovincial exports	1,187.4	1,251.8	1,510.1
8. International exports	1,380.8	1,315.4	1,038.0
9.Death/loss/condemnations	592.4	586.6	582.6
10. *Total output (6+7+8+9)*	6,791.4	6,922.0	7,101.5
11. Ending inventory	13,208.9	12,870.0	12,654.5

Source: Statistics Canada, Cat. No. 23-603-XPE.

3.4 Canadian Exports

Canadian beef exports in 1999 were over 370 thousand tonnes, an increase of 15% over 1998 (Table 7). The value of the beef exported was $1.52 billion, up from the $1.17 billion of the previous year. The US continues to be the dominant export market, taking 90% of Canadian exports of beef and almost 100% of live cattle exports. Japan was Canada's second largest customer for beef. Mexico, South Korea and Italy have recently started importing more Canadian beef.

Table 7: Canadian Cattle and Beef Exports, 1998-99

Country	Quantity		Value	
	1998	1999	1998	1999
Beef	Tonnes		$ mln	
US	327,228	368,163	1,166.1	1,481.2
Japan	20,792	16,257	87.1	86.1
Mexico	3,586	12,495	8.8	40.7
South Korea	3,858	9,224	14.9	40.0
Taiwan	1,340	1,203	6.9	6.4
Cuba	1,025	2,509	3.4	5.5
Hong Kong	1,198	986	3.6	3.3
France	52	220	0.2	2.1
Italy	98	308	0.5	1.7
Total	*366,717*	*418,840*	*1,303.1*	*1,676.3*
Live Cattle*	Number of head		$ mln	
US	1,313,248	988,777	1,409.6	1,068.2
Japan	0	16	0	0.03
Total	*1,313,248*	*983,793*	*1,409.6*	*1,068.2*

Source: Statistics Canada *excludes purebred breeding stock

3.5 Canadian Market Outlook

Table 8 provides the baseline projections for market outlook as prepared by Agriculture and Agri-Food Canada in the winter of 1999. Expansion of the cattle herd in the West will result in increased domestic slaughter and more feeding of cattle on the prairies. Exports of slaughter cattle originating in the west will diminish until 2002. Eastern Canada will become a net importer of both slaughter and feeder cattle beginning in 2001 and will remain a net importer until 2004. Domestic disappearance experience minimal increases with most of the increased production destined for the export market.

Table 8: Canadian Cattle and Beef Supply/Disposition, 1999-2005

	1999	2000	2001	2002	2003	2004	2005
	Thousands of Head						
Cattle Inventories	12845	12967	13301	13814	14398	14909	15271
Supply-Disposition							
Cattle marketings							
East	1098	1109	1043	1011	997	999	1010
West	3206	3108	3102	3135	3250	3423	3636
Total	4305	4218	4145	4146	4246	4423	4646
Slaughter							
East	1028	1088	1084	1076	1046	1012	981
West	2447	2458	2522	2557	2583	2605	2625
Total	3475	3545	3607	3633	3629	3617	3606
Net exports slaughter cattle							
East	70	22	-41	-65	-49	-12	29
West	759	651	580	578	666	818	1010
Total	829	672	539	513	617	806	1040
Net exports feeder cattle							
East	-64	-14	-6	-19	-26	-10	-5
West	210	205	173	157	181	217	250
Total	146	191	167	138	154	207	245
Beef Supply-Disposition		*Thousands of Tonnes*					
Production	1147	1192	1229	1255	1267	1276	1284
Imports	244	261	271	282	287	284	277
Disappearance	907	901	901	896	897	912	927
Exports	484	553	600	642	656	648	634
Ending Stocks	24	23	22	21	21	22	22
A1-A2 steer price Edmonton ($/cwt)	91	98	99	98	95	93	89
Wholesale beef price ($/cwt)	170.14	180.05	179.49	177.88	172.94	170.01	165.48
Retail beef price ($/kg)	6.15	6.46	6.49	6.50	6.43	6.40	6.32

Source: Statistics Canada, Conference Board of Canada Winter 1999 Medium Term Forecast and Conference Board of Canada Extrapolation of Winter 1999 Medium Term Forecast.

4. Manitoba Situation

4.1 Manitoba Production/Inventories

Manitoba has Canada's third largest beef cow herd, after Alberta and Saskatchewan with 12.3% of the nation's beef cows as of January 1, 2000. Inventory numbers peaked in the province in 1997 but have since suffered marginal declines each year. Manitoba's industry is 95% commercial cow-calf operations with the balance commercial feedlots. Recent estimates place the number of beef cattle farms at about 11,000. A large portion of the cattle raised in Manitoba is sold to Alberta and Ontario as feeder cattle and calves for further finishing prior to slaughter. Manitoba Agriculture has estimated that the

province's 12,000 beef cattle producers marketed over 500,000 head for slaughter or sale out of the province.

Table 9 presents the Manitoba supply/disposition situation for 1997 to 1999. Interprovincial exports are continuing to increase while international exports declined in 1999. Provincial slaughter is minimal given the limited packing capacity within the province.

Table 9: Manitoba Cattle and Calves Supply-Disposition, 1997-99

January to December	1997	1998	1999
Supply	Thousands of Head		
1. Starting inventory	1,229.0	1,212.0	1,176.0
2. Calves born	503.0	553.9	543.8
3. Interprovincial imports	32.9	33.9	38.2
4. International imports	0.2	0.1	0
5. *Total supply (1+2+3+4)*	*1,765.1*	*1,799.9*	*1,758.0*
Disposition			
6. Slaughter	47.9	36.0	38.4
7. Interprovincial exports	188.7	276.9	318.1
8. International exports	248.2	242.8	173.3
9. Death loss/condemnations	68.3	68.2	68.2
10 *Total output (6+7+8+9)*	*553.1*	*623.9*	*598.0*
11. Ending inventory	1,212.0	1,176.0	1,160.0

Source: Statistics Canada, Cat. No. 23-603-XPE.

4.2 Manitoba's Advantages

Manitoba has distinct cost advantages, particularly the availability and price of feed. With the elimination of the Western Grain Transportation Act, grain prices in Manitoba declined $30-35/tonne as the farmer had to pay the full cost of shipping their grain to export position. This has prompted farmers to look for alternative markets closer to their farms for their grains. These ample supplies of locally grown feed grains at prices that are lowest in Western Canada have encouraged the expansion of the livestock sector.

Manitoba has in excess of 5 million hectares of land with a capacity to support continued agricultural production. Ample grazing land has also facilitated the development of the cow-calf sector. In addition, the *climate* in Manitoba is favorable for livestock production with moderate summer temperatures making heat stress less of a problem and cold winters preventing disease carryover from year-to-year.

4.3 Slaughterings and Exports

Manitoba slaughters a minimal number of cattle. Inspected slaughter in Manitoba in 1999 was 19,611 head or 0.5% of Canadian slaughter. Manitoba origin cattle slaughtered in Canada was 56,000 head. Most of the beef cattle produced are sold out of the province.

In 1999, Manitoba exported $173.5 million worth of cattle into the US. US exports were 159,450 head of slaughter cattle and 10,040 head of feeder cattle. This contrasts with the estimated net movement of about 320,000 feeder cattle and calves sold to other Canadian provinces for further finishing.

Manitoba's focus will continue to be on the cow-calf and feedlot components as there is minimal slaughter facilities within the province and state-of-the art facilities located in Alberta which have the capability of slaughtering all the slaughter cattle raised in Western Canada

Table 10: Manitoba Cattle and Beef Sector, 1999

	1996	1997	1998	1999
Number of Farms	11,900	11,760	11,290	10,920
Cattle on Farms (000's) July 1				
Bulls (incl. Dairy)	30.0	29.0	25.0	26.0
Beef Cows	540.0	566.0	560.0	554.0
% of Canada	11.3	12.2	12.2	12.2
Beef Replacement Heifers	95.0	93.0	85.0	81.0
Beef Slaughter Heifers	73.0	81.0	86.0	62.0
Steers	80.0	90.0	97.0	89.0
Calves under one year (incl. Dairy)	535.0	520.0	525.0	520.0
Beef Cattle	1,353.0	1,379.0	1,378.0	1,332.0
% of Canada	10.2	10.6	10.3	10.1
Production (000's)	500	473	479	521
% of Canada	10.1	9.5	10.6	10.9
Value of Production ($ mln)	325	370	415	444
Cash Receipts ($ mln)	311.5	373.8	455.6	448.7
% of Canada	6.6	7.1	8.0	7.2
Average Cattle Prices ($/cwt)				
Grade A Steers	78.69	82.70	82.63	86.78
D1,2 Cows	47.22	51.91	53.30	56.40
Feeder Steers (800-900 lb.)	75.91	94.38	99.42	104.84
Steer Calves (500-600 lb.)	79.90	106.40	116.84	126.48
Slaughter				
Inspected in Manitoba	39,158	31,227	20,384	19,611
% of Canada	1.2	1.0	0.5	0.5
Mb- origin Slaughter in Canada	63,824	55,029	39,550	56,000
% of Canada	1.9	1.7	1.1	1.5
Beef Production (Million lb.)	25.8	21.0	14.0	13.9
($ million estimated)	34	30	19	20
Exports Cattle ($ mln)	186.5	220.0	238.4	173.5
Beef & Beef Products ($ mln)	3.4	4.3	5.2	6.5
Cattle Hides ($ mln)	0.5	0.4	0.5	0.5
Imports Cattle ($ mln)	0.1	0.3	0.6	0.8
Beef & Beef Products ($ mln)	10.7	9.8	13.3	12.3
Cattle Hides ($ mln)	22.2	26.4	16.7	17.0

Source: Manitoba Agriculture and Food, 1999 Manitoba Livestock Industry Profiles.

ECONOMIC BACKGROUND ON POULTRY AND EGGS

Heather Gregory, Pivotal Plus Consulting Ltd.

1. Overview of World Situation

1.1 World Poultry Production

Poultry meat (chicken and turkey) production is forecast to expand by almost 4% in 2000 (Table1). Import demand for poultry meat, particularly in Asia, has help prevent further price declines. The major producing countries continue to expand production as input prices remain low. The US is the world's largest poultry producer. Poultry meat production is forecast to increase 4% in 2000, slightly below the 5.6% increase recorded in 1999. Brazil's chicken production increased by nearly 15% in 1999 in response to strengthened domestic demand and record exports. Producer returns declined in the last prices rose. For 2000, chicken production is forecast to increase 6%. Mexican production of chicken increased 12% in 1999 due to low feed grain prices and robust domestic demand. Production is expected to increase a further 6% in 2000. Egg production rose 8% in 1999 and is projected to increase 3% in 2000 to meet domestic demand. Broiler chicken production in Thailand grew 5% in 1999 and is projected to increase 7% in 2000. Strong domestic poultry consumption supports some of this increase as well as continued improvement of production technologies.

In the European Union, French poultry production is expected to continue to decline in response to strong export competition and sluggish domestic demand. Egg production is also forecast to decline 1% from the high 1999 level due to excessive stocks. Poultry production in the Netherlands remains static as future growth is tempered by consumer concerns about animal welfare and the environment. Exports in 1999 were weak because of the dioxin contamination scandal.

1.2 World Poultry & Egg Trade

Eggs

International trade in egg and egg products is expanding but a slow pace with annual trade ranging between 5.4 and 6.7 million eggs. Canada is the fourth largest exporter in the world having 6% of world trade. The US has about 30% of global exports followed closely by the Netherlands with 23%. Some countries such as France, the United Kingdom have dramatically increased their exports over the last five years. Canadian exports have grown at a slow steady pace. Canada's major export market has been the US. Even though the US is an exporter, its size of market and proximity to Canada make it a logical destination for Canadian product.

Table 1: Global Poultry Meat Production, 1995, 1999 & 2000

Country	1995	1999 Preliminary	2000 Estimate
	Thousands of Tonnes		
US	13,786	15,981	16,623
China	8,440	11,000	11,350
Brazil	4,140	5,269	5,577
France	2,083	2,245	2,240
Mexico	1,554	1,919	2,033
United Kingdom	1,394	1,516	1,555
Italy	1,123	1,135	1,197
Japan	1,282	1,190	1,185
South Africa	692	1,118	1,150
Thailand	825	1,025	1,100
Canada	861	1,004	1,040
Total	*47,524*	*55,886*	*57,902*

Source: USDA Foreign Agricultural Service, March 24, 2000

Egg imports into Hong Kong continue to increase 2% annually. China is the largest supplier of egg to Hong Kong, but in 1999 due to a weaker currency and the availability of export refunds, Netherlands edged out the US as the second largest egg supplier to Hong Kong. Japan's egg imports will show moderate growth despite frozen inventories being high because of declining domestic egg production.

US exports of eggs to Mexico dropped by 40% in 1999 as the Mexican government restricted access to US fresh table eggs beyond the border regions. In addition, new regulations that came into effect in February of 2000 requiring continuous refrigeration of shell eggs will reduce import levels.

Canada is the third largest egg importer. These eggs are used by the egg processing industry to meet the growing demand for industrial egg products.

Poultry Meat

World trade in poultry meat ranges between 5.6 and 6.4 million tonnes annually. The US accounts for over 40% of world trade in poultry meat products. The modest growth in poultry meat exports is expected to be to the Asian markets. Brazilian exports in addition to Hong Kong and Japan also include Saudi Arabia. The Saudi Arabia market is expected to continue to remain a strong market for Brazil in 2000. A significant volume of Hong Kong's exports is to China in order to meet the growing domestic demand for protein. Brazil and the US both supply the Hong Kong market. Exports from Thailand face strong competition from Brazil, the US and China. Thailand has been shifting its sales to Japan and the European Union from uncooked to cooked products.

Poultry meat production in Russia has stabilized. However, Russia continues to import product to satisfy consumer demand. Russian poultry imports in 1999, including transshipments through

the Baltics, were estimated at 865,000 tonnes. Food aid from the US totaled 52,000 tonnes in 1999. Expectations on for US food aid to be 22,000 tonnes in 2000.

The increase in poultry meat imports into China relates to the Chinese government's anti-smuggling campaign and its desire to enter the WTO. With reduced smuggling, the data is now capturing more of the actual trade.

Canada is the seventh largest importer of poultry meat. Since 1997, imports have ranged between 128,000 tonnes and 136,000 tonnes.

1.3 Per Capita Consumption

Eggs

Egg consumption on a per capita basis has been increasing in North America (Table 2). For Canada and the US, the increase is primarily due to the increased use of egg products in convenience foods. In the US, processed eggs increased from 15% of total egg production to 29% between 1981 and 1997. For Canada, industrial egg production has increased from about 8% in the early 1980's to 18% by 1997. A survey by the egg industry in 1998 suggests the majority of large egg producing companies in the US plan to increase the portion of eggs that go for breaking (industrial use). The decline in table egg consumption for the last twenty years has been influenced by health concerns regarding issues such as dietary cholesterol. Demand for eggs in Canada has started to re-bound as recent findings suggest that dietary cholesterol in food is not directly transformed into blood cholesterol. The introduction of eggs with high levels of Omega-3 fatty acids has also boosted sales. For countries such as Korea, China and India, eggs are an economical source of protein.

Poultry Meat

Poultry meat consumption continues to increase world-wide as production grows (Table 3). Most countries in the world have seen increased per capita poultry meat consumption. Exceptions would be countries such as Russia were economic conditions restrict imports and ability to buy product and Japan were recent disease problems in domestic production limited availability of poultry meats.

1.4 Cost Comparisons of Egg Operations for Selected Regions/Countries

The George Morris Centre completed a study for the Manitoba Rural Adaptation Council in 1998 on the cost competitiveness of the egg industry in western Canada (Table 4). The top five egg producing states in the US are Ohio, California, Iowa, Indiana and Pennsylvania. These states represent about 50% of American production. The number of egg producers in the US has been declining sharply as the industry consolidates. In 1996, there were 900 egg operations but 345 operations accounted for 94% of production. Based on US experience, the George Morris Centre study focused on two sizes of operations---a one million layer operation and a 150,000 layinghen farm. The comparison is based on feed, labor, depreciation and interest costs. As shown in

Table 4, the main advantage for western Canada is the feed cost which has declined since the removal of the western grain transportation subsidy. Egg yields per bird are higher in Canada than the US—Canada in 1997 averaged 269 eggs/bird versus the US 255 eggs/bird.

Table 2: Per Capita Egg Consumption for Selected Countries, 1995 to 2000

Country	1995	1996	1997	1998	1999	2000	% change (2000/1995)
	Eggs Per Person						
Canada	198	203	207	210	212	212	+7
Mexico	276	275	292	304	323	327	+18
US	236	238	240	245	256	259	+10
Brazil	98	96	75	80	85	89	-9
France	264	258	254	259	266	262	-1
Germany	225	227	227	226	226	227	+1
Netherlands	183	183	183	193	192	188	+3
Russia	212	198	201	210	207	205	-3
Turkey	121	123	128	122	87	91	-25
China	246	252	272	288	295	308	+25
Hong Kong	268	269	227	223	223	224	-16
India	29	30	33	34	34	36	+24
Japan	342	344	353	348	347	346	+1
Korea	177	183	183	173	175	176	+19
Taiwan	301	325	361	359	359	358	+19
Thailand	132	137	146	140	135	141	+7

Source: USDA Foreign Agricultural Service, March 24, 2000

Table 3: Per Capita Poultry Meat Consumption for Selected Countries, 1995 to 2000

Country	1995	1996	1997	1998	1999	2000	% change (2000/1995)
	Kgs Per Person						
Canada	30.5	30.7	31.4	32.0	33.4	34.9	+14
Mexico	18.4	18.8	18.9	19.8	21.6	22.4	+22
US	44.7	45.7	46.2	46.7	49.4	51.0	+14
Brazil	22.7	21.5	23.2	23.4	25.0	27.2	+20
France	22.3	24.8	24.7	25.1	24.1	24.3	+9
Germany	13.5	14.1	14.7	15.0	15.1	15.3	+13
Netherlands	20.4	21.3	21.8	22.2	22.8	23.0	+13
Russia	11.6	12.2	12.7	10.6	10.2	10.0	-14
Turkey	6.3	7.6	9.3	9.6	10.3	10.9	+73
Kuwait	40.6	44.5	44.7	40.8	41.7	42.6	+5
China	7.3	8.2	8.8	9.0	9.5	9.7	+33
Hong Kong	49.9	50.3	52.5	59.0	67.2	71.8	+44
India	0.6	0.7	0.7	0.7	0.7	0.7	+17
Japan	14.4	14.4	14.0	13.8	13.7	13.8	-4
Korea	10.0	10.8	10.8	9.5	10.4	10.7	+7
Taiwan	29.4	31.1	34.1	33.6	34.8	34.3	+17
Thailand	11.0	12.0	12.6	11.6	12.2	12.9	+17

Source: USDA Foreign Agricultural Service, March 24, 2000

Table 4: Costs by Province/State by Size of Operation (Averaged 1995-98)

Province Or State	One Million Hens			150,000 Hens		
	Feed	Labor	Total Cost	Feed	Labor	Total Cost
	Cents Per Dozen					
Quebec	34.3	3.3	64.1	31.5	1.9	53.6
Ontario	33.6	3.2	63.3	29.5	1.9	51.6
Manitoba	31.5	3.3	58.1	27.7	1.9	47.4
Sask.	30.2	3.0	56.5	26.5	1.8	46.1
Alberta	31.5	3.8	56.4	27.6	2.3	46.1
Ohio	33.2	4.4	58.2	29.1	2.5	47.4
California	45.3	4.6	70.6	39.7	2.6	58.1
Iowa	32.0	4.2	56.8	28.1	2.4	46.2
Indiana	33.1	4.4	58.2	29.1	2.5	47.3
Pennsylvania	37.3	3.6	61.6	32.8	2.1	50.6

Source: George Morris Centre, Prospects for Expanded Egg Production in Western Canada, October 1998.

2. Overview of the Canadian & Manitoban Egg Situation

2.1 Canadian Egg Industry

In 1998, there were 1,216 registered Canadian producers with 15.1 million laying hens that produced about 430 million dozen eggs with a farm gate value of $460 million. About 82% of the production is sold as table eggs the remaining 18% is used in the egg breaking./processing sector. Producers pay a uniform fee or levy on all eggs produced to finance the CEMA's and provincial board's operations.

Under supply management, the amount of product imported into Canada is subject to import controls. Product volumes up to a given level are imported at one tariff rate. The volume is based on 1.647% of the previous year's domestic production. Volumes beyond this permitted level enter at a higher rate. In 1999, the import quota volume for table eggs was almost 18 million dozen eggs. This volume could enter Canada with no tariff assessed. Beyond that volume, the tariff was 168% but not less than $0.823/dozen.

Production

There are two distinct markets for eggs—the table egg market and the industrial egg market. When the supply management system was first introduced, the industrial product market was a by-product market that absorbed excess egg production. This excess egg production was necessary to ensure consistent supplies of eggs in the appropriate grades to meet the table egg market demands. Because the industrial eggs are priced less than table eggs, all producers across Canada contribute to the surplus egg removal program through levies. Over time, this market has grown from 5% of total production to 18%. However, the number of surplus eggs in a province will vary considerably depending on its allocation in relation to demand. Manitoba has about 4% of the population but 11% of the production and, as such, has about half of its egg

production destined for the industrial market. This has resulted in a reassessment of who should contribute to the surplus egg removal program. Recent changes in the pricing policies of industrial eggs now means that the processor prices reflect the cost to the nearest alternate supply. This resulted a 3 cent/dozen reduction in the Manitoba industrial egg price.

As shown in Table 5, the supply of eggs in Canada increased 2.7% in 1999 and 6.4% over the 1995 to 1999 period. Manitoba's share was 11.4% of the total supply. Ontario accounted for 38.9% while Quebec produced 18.3%.

Table 5: Supply of Eggs in Canada, 1995-99

Province	1995	1996	1997	1998	1999
	Boxes of 15 Dozen Eggs				
Quebec	5,179,049	5,246,270	5,276,772	5,280,133	5,512,278
Ontario	10,432,615	10,449,937	11,210,203	11,427,756	11,708,235
Manitoba	3,377,759	3,277,042	3,322,966	3,290,765	3,432,693
Sask	1,042,651	1,146,877	1,189,683	1,174,369	1,211,276
Alberta	2,215,826	2,171,813	2,257,948	2,310,811	2,356,427
BC	3,463,487	3,554,112	3,521,027	3,466,008	3,487,910
Canada	*28,308,758*	*28,207,252*	*29,137,094*	*29,326,119*	*30,108,357*

Source: CEMA

Costs of Production

Table 6 provides a summary of the pullet, labor and feed costs of production for 1998 for selected provinces. Manitoba's feed costs were slightly above Alberta's feed costs based on the monthly survey done by CEMA (Canadian Egg Marketing Agency). Overall Alberta had the lowest provincial costs with Manitoba a close second.

Table 6: Provincial Production Costs, 1998

Province	Pullet Cost	Feed Cost	Labor Cost	Provincial Based Costs
	Cents Per Dozen			
Quebec	16.82	41.51	24.79	83.12
Ontario	18.13	39.23	24.97	82.33
Manitoba	18.47	38.69	24.53	81.69
Sask	19.52	42.62	24.50	86.64
Alberta	17.66	38.42	24.69	80.77
BC	19.32	45.82	25.17	90.31

Source: CEMA

Processing

Table 7 summarizes the western Canadian egg processors and the companies operations.

Table 7: Western Canadian Egg Processors

Company	Boil & Peel	Dry	Freeze	Liquify	Enzyme Extraction	Value-Added
Canadian Inovatech British Columbia		X	X	X	X	X
Highland Produce Alberta		X	X			X
Canadian Inovatech Manitoba		X	X	X	X	X
Crystal Egg Manitoba	X		X	X		

Source: Agriculture and Agri-Food Canada

2.2 Manitoba Egg Industry

Production

Egg production in Manitoba is located primarily in the southeastern region. About 75% of production takes place within 80 km of Winnipeg. In 1999, there were 190 registered egg producers and about 300 unregistered producers with over 2.1 million hens. Unregistered producers are allowed to have up to 499 laying hens.

Manitoba has the largest production unit in Canada with 500,000 hens. The typical flock size is 10,000 hens. As of 1997, producers were permitted to apply to consolidate their quotas into new single business entities to take advantage of economies of scale and to encourage reinvestment in facilities. A group of eleven quota holders established Millenni Egg and built a 150,000 layer complex at a cost of $3-4 million. They have since expanded to a second barn.

Total egg sales, including both registered and unregistered production, were 51.53 million dozen eggs, about 4% higher than 1998. Three provincial hatcheries set 12.9 million eggs in 1998 and hatched 10.2 million chicks. About 2.52 million pullet chicks were placed and almost 2.6 million chicks exported out of the province. Total receipts from commercial egg production in 1999 were $47 million, down 1% from 1998.

There are three commercial grading stations and 36 registered farmer graders in the province that graded over 49 million dozen eggs in 1999. Registered producers marketed about 2.45 million dozen eggs privately.

Processing

Manitoba has two egg processors, Crystal Egg and Canadian Inovatech. They employ 112 people and are noted for their innovative, value-added products for the food and pharmaceutical industries. Manitoba has pioneered new relationships with egg processors to develop markets for specialized products and open new opportunities.

3. Overview of Canadian & Manitoban Turkey Situation

3.1 Canadian Turkey Industry

Production

Manitoba has approximately 7.1% of Canada's turkey quota compared to 3.9% of the Canadian population. Production in 1999 was 0.4% higher than the 1998 figure of 138.6 million kg of meat. PEI and Newfoundland do not raise turkeys.

In 1999, 551 turkey producers across Canada grew 139.1 million kg of product. Total turkey exports were 16.8 million kg and imports were 4.2 million kg. Per capita consumption has been relatively static in the 4.2 kg range. Retail sales of turkey in Canada in 1999 were 18.4% whole fresh, 59.0% whole frozen, 9.0% parts and 13.5% processed. Sales of processed products have been the growth area

Imports

To maintain the integrity of the supply managed system, imports into Canada from other countries were restricted to pre-defined, annual levels using import quotas. However, under the GATT, import quotas were replaced with high tariffs and global access to the Canadian market was set at 3.5% of domestic production. The initial tariff rate was 182.1% or $2.30/kg in 1995. This tariff will decline 15% over the next six years of the Agreement.

The Canadian system allows importation, processing and re-export. Currently there are no HACCP approved storage facilities for frozen products in Manitoba. Frozen product would have to be transported to Saskatoon prior to receiving clearance. Fresh products do not have the same HACCP requirements and therefore may present the best opportunity for import/re-export.

Export Policy

To facilitate the development of the Canadian turkey industry, CTMA (Canadian Turkey Marketing Agency) allows Canadian birds or their meat to be exported. Processors who export must apply to the CTMA for a permit and must keep detailed records to verify the product slaughtered is actually exported. If the meat is further processed and then exported, a ruling by CTMA is required to determine if they will consider the exports outside the provincial quota.

3.2 Manitoba Turkey Industry

Production

Turkeys are raised year round in Manitoba with an average farm producing 7,000 turkeys, three times a year. Manitoba raises approximately 1.6 million birds annually. The major producing areas are the Interlake region and south/south-east portions of the Province. Table 8 summarizes Manitoba's turkey production levels for the last five calendar years. Broilers are male or female birds under 6 kg. Hens are female birds 6 to 8 kg. And, toms are birds over 8 kg.

Table 8: Manitoba Turkey Production, 1993-99 (000s of eviscerated kgs)

Category	1995	1996	1997	1998	1999
Broilers	1,393	1,194	848	991	791
Hens	3,473	4,247	3,914	4,034	4,010
Toms	4,759	3,931	4,197	4,001	4,233
Matures	473	519	516	551	526
Total	10,097	9,891	9,475	9,576	9,560

Source: Canadian Turkey Marketing Agency and Agriculture & Agri-Food Canada

Processing

In 1999, there was only one turkey slaughtering/processing facility, Granny's Poultry Co-operative (Manitoba) Limited. Up until the September, 1998 closure of Readyfoods Limited, Manitoba had two further processors of turkey meat. The only other remaining processor is Prairie Produce.

Exports

Manitoba exports went to seven different countries in 1999 including Russia, Jamaica, South Africa, China, Peru and the Dominican Republic. Most of these exported products were turkey parts but also included a quantity of specially sized, whole broiler turkeys and deboned meat for the Japanese market. Thirty-four export sales amounting to 759,900 kg worth almost $0.4 million were made. This represented an 8% increase from the 703,300 kg exported in 1998. The Manitoba Turkey Producers was able to qualify for the Export Policy of CTMA to receive export credits for replacement production. Live birds have also been exported to the US for slaughter.

Cost of Production

The Manitoba Turkey Marketing Board uses the cost of production along with supply and demand in the marketplace, existing storage stocks and the price of competing meats to negotiate a purchase price for live birds. Manitoba has the lowest feed costs for broilers and hens amongst all the turkey producing provinces. Based on the cost of production information and the trend towards deregulation, it would make the most economic sense for domestic and foreign investors to locate a slaughter and processing plant in least-cost producing area in Canada, that is Manitoba. Manitoba has a number of strengths specific to the turkey industry. These include: second largest turkey hatchery in Canada, 35% unused capacity in existing barn space, and least-cost producing province in Canada which is linked to low feed grain costs.

4. Overview of Canadian and Manitoban Chicken Industry

4.1 Canadian Chicken Industry

Size and Number of Farms

Table 9 indicates the number and size of chicken farms in each province for 1998 and 1999. Farm size is considerably smaller on the prairies as compared to other provinces. The numbers of chicken farmers increased 2.2% between 1998 and 1999. Average size of farm operation in Canada increased 3.6%. Manitoba had an 8% increase in number of producers from 121 to 131 between 1997 and 1998 but lost one producer in 1999. A 15.4% increase in average farm size from 317,000 kg to 368,000 kg of live weight also occurred between 1997 and 1999.

Production

In 1999, Canada's chicken production reached 838.3 million kilograms, an increase of 6% (Table 10). Western Canada led the country in growth, increasing 9.9% over 1998. Alberta's production increased 7.7%, BC 9.6%, Manitoba 11.2% and Saskatchewan 20.3%. Production in Central Canada (Quebec and Ontario) rose 4%.

Table 9: Number of Chicken Farmers and Average Farm Size By Province, 1997-1999

Province	1997		1998		1999	
	No. Farms	Av. Size (000 Kg)	No. Farms	Av. Size (000 Kg)	No. Farms	Av. Size (000 Kg)
BC	308	483	303	528	301	583
Alberta	311	292	306	319	321	330
Saskatchewan	73	299	73	301	73	361
Manitoba	121	317	131	328	130	368
Ontario	1,064	319	1,093	328	1,150	323
Quebec	727	406	744	415	737	438
New Brunswick	40	703	39	776	39	799
Nova Scotia	79	456	81	465	81	494
PEI	7	548	7	544	7	593
Newfoundland	20	684	20	750	20	755
Canada	2,750	370	2,797	385	2,859	399

Source: Chicken Farmers of Canada

Prices

In 1998, the weighted average farmer price ranged from $1.20 to $1.49/kg. Feed costs are the largest component in the cost of raising birds. Because Ontario is the leader in establishing farmer prices, changes in Ontario's feed costs are usually reflected in farmer prices across the country. Data for 1999 has not been published yet. For Manitoba, in 1999, prices ranged from $1.09/kg to $1.14/kg.

Consumption

There is a seasonal nature to chicken consumption with peak production and consumption occurring in the summer months. Total Canadian consumption was 797.6.5 million kg in 1998, an increase of 3.5% over 1997. Per capita consumption was 26.1 kg., an increase of 0.7 kg from the previous year. Chicken continued to increase its share of meat consumption in Canada. Preliminary chicken consumption for the various market sectors in 1999 was estimated to be 57.4% retail sales, 25.6% fast food, 11.3% full service restaurants and 5.5% hotels and institutions.

Table 10: Annual Provincial Production, 1993-98 (000 kg eviscerated)

Province	1994	1995	1996	1997	1997	1998
BC	96,536	99,204	102,917	109,204	117,669	128,952
Alberta	57,163	59,739	60,151	65,960	71,769	77,263
Saskatchewan	16,401	15,504	15,263	16,046	16,142	19,413
Manitoba	24,537	26,160	26,744	28,219	31,613	35,140
Ontario	237,539	231,141	242,198	250,790	264,486	273,728
Quebec	200,417	199,759	208,010	217,326	227,102	237,306
New Brunswick	17,778	18,304	19,672	20,703	63,811	66,489
Nova Scotia	22,827	24,449	25,374	26,509		
PEI	2,482	2,650	2,723	2,820		
Newfoundland	9,430	9,985	10,453	10,062		
Canada	685,110	685,894	713,505	747,892	792,594	838,291

Source: Chicken Farmers of Canada

Processing

In total, Canada had 63 federally inspected poultry processing plants and 46 provincially inspected plants. Of the 63 federally inspected plants, 21 were in Ontario, 19 in Quebec and 10 in BC. Thirty-three of the provincially inspected plants are located in Ontario.

Imports

A total of 69.3 million kg of chicken and chicken products were imported into Canada in 1998--- 55.6 million kg were imported under the TRQ while the balance consisted of supplementary import licenses. Chicken parts accounted for about 90% of the TRQ imports.

Exports

Canadian processors exported 58.4 million kg in 1998. This represented a 30.3% increase over the 44.8 million kg exported in 1997. Bone-in products (chicken legs and leg quarters) and mechanically separated meat are the major exports. Exports were to Cuba, Russia, China, South Africa, the US and Hong Kong. Cuba takes about 55% of Canadian exports, Russia 14%, China 13% and the US and South Africa each 7%.

While there were only six processors that exported more than 1 million kg of chicken products in 1998, there were 13 establishments that shipped more than 1 million kg each of chicken products. Some exporters use the services of brokers. Due to size of Canadian poultry companies and depending on the cuts needed, it is sometimes necessary to gather product from several plants. The top twenty exporters in 1998 accounted for almost 85% of total exports. Of these twenty, there was an even split between processors and brokers.

4.2 Manitoba Chicken Industry

Production

In 1999, Manitoba had 128 registered broiler chicken producers. Non-registered production marketed through a federally or provincially inspected plant must be covered by an "Exemption to permit marketing to a specified process". There is a limit of 999 birds per non-registered producer. The Board has a list of people eligible for the exemption based on historical marketings. Most of the non-registered production is custom kill. The size of the farms ranged from about 50,000 birds to 1.5 million birds.

According to AAFC records on federally registered hatcheries that are in the business of producing hatching eggs, Manitoba has nine hatcheries. Because broiler hatcheries are larger than egg layer hatcheries, they are more likely to concentrate solely on hatching broiler chicks. The hatcheries supply 25.8 million chicks to Saskatchewan and Manitoba. Approximately 1.5 million chicks are sold to Saskatchewan producers.

Cost of Production

Table 11 provides the average cost of production for chicken across Canada from 1995 to 1998. Since 1996, Manitoba has been the least cost province. In 1998, 47% or $0.597/kg was feed costs, $0.287/kg chick costs, $0.135/kg labor, $0.161/kg operating costs and $0.094/kg capital costs.

Table11: Average Cost of Production, 1995-98

Province	1995	1996	1997	1998
	Cents Per Kg Live Weight			
BC	127.1	142.4	139.9	137.7
Alberta	123.1	130.3	131.4	122.4
Saskatchewan	119.7	131.1	129.6	122.0
Manitoba	118.1	130.5	127.5	120.4
Ontario	117.9	136.1	132.3	124.5
Quebec	124.5	141.0	136.2	125.6
New Brunswick	128.4	144.8	142.9	135.2
Nova Scotia	125.6	140.2	136.6	131.2
PEI	135.6	148.0	143.1	136.9
Newfoundland	156.8	173.8	171.7	167.4
Canada	*122.8*	138.7	*136.2*	*127.4*

Source: Chicken Farmers of Canada

Processing Capacity

Two plants in Manitoba slaughter the majority of the registered birds. Granny's Poultry Co-operative Ltd. processes about 300,000 chickens each week. The Granny's plant is currently doubling its square footage, and installing an automated receiving area, a high-speed eviscerating line and an air-chill system. The expansion will cost $9.2 million. With minimal capital investment, Granny's could double its chicken production. Granny's employs about 400 people and has sales exceeding $70 million. Chicken products sold by Granny's are fresh/frozen whole birds, 9 piece cut and tray packs. It also slaughters turkeys. The other major plant is Dunn-Rite Food Products with 38% of the provincial slaughter. Dunn-Rite only kills chicken and is the portion sized poultry processor for the food service industry. Sales include fresh/frozen chicken and cut up chicken. Sales are $25 million with 200 people employed. Other plants include Pembina Poultry Packers, a small, labor intensive operation in Morden which has sales of $5 million and employs 75 people. Pembina also processes geese and turkeys. Prairie Produce Inc. is a small further processing operation that uses chicken and turkey meat. For Manitoba to capitalize on its lower cost of raising chickens, it would have to expand the further processing component of the industry.

Manitoba in 1999 exported 1,615,128 kg eviscerated product compared to 524,881 kg in 1998. Exports occurred in all the allocation periods although demand was lower in the latter half of the year. A large portion of the exports went to Cuba.

ENVIRONMENTAL REGULATIONS AFFECTING INTENSIVE LIVESTOCK OPERATIONS IN CANADA

Heather Gregory, Pivotal Plus Consulting Ltd.

This report summarizes environmental regulations affecting intensive livestock regulations in all provinces of Canada except Manitoba. Manitoba regulations are summarized in *Livestock Stewardship 2000: A Public Discussion Paper*, a document prepared by the Government of Manitoba and released in June 2000.

1. British Columbia

Two key pieces of legislation affect intensive livestock production and manure management in BC. The Farm Practices Protection Act of 1996 protects producers from nuisance actions arising from agricultural operations and farming activities, subject to these operations being in accordance with generally accepted farm practices. The Waste Management Act is designed to control pollution in the province. It specifies the requirements for managing the collection, storage, handling, use and disposal of manure. The applicable regulation under this Act is the Agricultural Waste Control Regulation: Code of Agricultural Practice for Waste Management.

Municipalities may regulate:

- Areas within a region where livestock production is permitted
- Setback distances from property lines and watercourses for farm buildings
- Building requirements in flood plains
- Nuisance such as excessive noise or odour.

The Farm Practices Reference Guide provides information on acceptable farm practices that can be used as guidelines to describe current practices used by farmers throughout BC. The guide is updated on a regular basis to include other commodities and practices as required. The guide is also used by the Farm Practices Board, the statutory body established under the Farm Practices Protection (Right-to-Farm) Act, to hear formal complaints about farm practices. They use this guide as information but are not obliged to take the practices identified as "the" practice when issuing a decision.

The Farm Practices Protection Act (replaces the Agricultural Protection Act) gives farmers the right to farm in BC's important farming areas, particularly the Agricultural Land Reserve, provided they use normal farm practices and follow other legislation listed in the Act (Waste Management Act, Pesticide Control Act, the Health Act).

A normal farm practice is an activity "that is conducted by a farm business in a manner consistent with proper and accepted customs and standards as established and followed by similar farm businesses under similar circumstances". Farm practices vary with local or regional conditions.

The "right-to-farm" part of the Act exempts farm practices from certain local government bylaws (nuisance and miscellaneous bylaws under Section 789(1) (a) or (b), 932 and 933 of the Municipal Act). A local government's nuisance bylaws will continue to apply to a farmer's non-farm activities.

If a complaint is filed and mediation results in no settlement, then the Chairman of the Farm Practices Board may appoint three members of the board to be a panel to hear the complaint. The panel rules on whether or not the practice is a normal farm practice. A written decision is required along with the reasons for the decision. Within 60 days of receiving the written notice, an appeal can be filed.

A new division of the Municipal Act provides for the development of bylaw standards. These standards that are to be developed with the assistance of local governments, the farm community and the Agricultural Land Commission help local governments prepare zoning and rural land use bylaws and new farm bylaws that support farming.

The Agricultural Land Commission Act establishes a commission to:

- Preserve agricultural land
- Encourage the establishment and maintenance of farms and the use of land for agricultural purposes
- Assist municipalities and regional districts to prepare land reserve plans
- Encourage all levels of government to support farm use of agricultural land in their bylaws, plans and policies.

Land designated in a land preserve cannot be used for any other use except farming unless an application is filed and approved by the Commission. This Act therefore recognizes the impact of urban expansion on farming.

Non-point source (NPS) water pollution results from fertilizers, manure, pathogens, pesticides and sediments that enter surface and groundwater if agricultural practices are improperly managed. The Water Action Plan of March 1999 focuses on NPS pollution control and prevention. The action plan includes:

- Education and training
- Prevention at the site using best management practices [the Code of Agricultural Practice and Guidelines instruct farmers how to reduce pollution]
- Land use planning, coordination and local action to identify water quality strategies and to encourage local participation in water quality protection
- Prioritize watersheds for pollution control actions, implement pilot projects, assess their effectiveness and report results
- Assess the potential for using market-based incentives such as lower financing charges, tax breaks, etc. to motivate pollution prevention
- Implement existing statutes, analyze any shortfalls and fill the gaps.

Land use plans are to incorporate the water resource management objectives. In terms of agricultural waste management, the actions are:

- To continue to improve administration of the existing Agricultural Waste Control Regulation under the Waste Management Act

- To consult all stakeholders including the public and agricultural industry to address concerns where water quality problems exist
- To lead and develop a new government-wide policy for improvements in agricultural management
- To implement a new agricultural pollution management policy.

The BC ministry has prepared "Investment Information on the British Columbia Hog Industry" to encourage producers to move industry expansion away from the Fraser Valley to the Peace River and North Okanogan areas where there is a greater capacity to use the manure and good availability of feed grains.

2. Alberta

Alberta's livestock associations have developed a set of voluntary guidelines to assist municipalities and producers in siting, design and management of new and expanding livestock facilities. The Code of Practice for the Safe and Economic Handling of Animal Manure provides the producer with detailed information on siting to reduce odor and avoid contamination, as well as manure storage and manure usage.

The Code of Practice for the Safe and Economic Handling of Animal Manure is intended to help producers minimize the potential for nuisance and environmental problems, act as a guideline for municipal land use bylaws, provide a framework for agricultural standards for enforcement of legislation and provide a framework for the conflict resolution processes.

Control for manure management is at the municipal level. Municipal permits specify the manure management requirements using the guidelines. The manure management plan identifies where the manure will be applied, how facilities and storage will be designed and maintained and under what conditions and at what levels the manure will be applied. When request by a municipality, Alberta Agriculture, Food and Rural Development (AAFRD) will assess a farmer's manure management practices relative to the guidelines. Municipalities familiar with intensive livestock operations generally have well defined procedures on new development; others have none.

The main piece of legislation that regulates the storage, collection and treatment of wastes is the Environmental Protection and Enhancement Act. This legislation encourages the public to become involved through educational programs, public consultation on all aspects of the regulatory process, and reporting their concerns regarding compliance. Firm but fair guides the severity of the enforcement response relative to the offence.

The Environmental Assessment process integrates environmental and economic decisions in the early stages of a proposed activity. An approval process allows Alberta Environment to conduct

detailed reviews of specific projects and set the terms and conditions on the siting, proposed emissions and discharge control technology. Operators must monitor their activities to ensure compliance with the terms and conditions of the approval. Alberta Environment investigates public complaints and encourages the public to report concerns. If suspect of non-compliance,

Alberta Environment investigates and, if negligent, they determine the appropriate enforcement tool, either administrative or prosecution. Penalties can include fines of up to $1 million and two years in jail.

Under the existing Water Resources Act, hog operations with 100 or more sows, farrow-to-finish operations or those with 1,000 feeder pigs or more require a license.

When applying to the municipality, the applicant must provide:

- An operation location map illustrating the surrounding land uses for a 20 to 25 section area
- A surrounding land use diagram detailing houses, buildings, roads, wells, etc within one mile of the proposed site
- A detailed sketch of the proposed development.

Sites must have soil and hydrological tests to determine the permeability of the site, the depth of the bedrock and water table and the general soil make up.

The municipality screens the application for environmental sensitivity. This is based on the siting and the manure management guidelines in the Code of Practice. Municipalities are encouraged to use the provincial intensive livestock operation definition but they can make the definition more stringent (but not less). [The provincial definition is an operation where the number of animals in confinement on a farm equals or exceeds the threshold of 300 animal units and where the livestock are confined in a facility at a density of 43 animal units per acre for more than 90 consecutive days and the producers has to manage the manure generated at the facilities.]

If the proposal meets the guidelines and is not environmentally sensitive, the municipality assesses if it complies with the land bylaws. If it does then, a permit may be issued. A permit may either be issued with conditions or without them.

If the proposal does not meet the guidelines, it is sent to AAFRD for suggestions on how to make it acceptable using the guidelines as the basis for the technical assessment. Once AAFRD makes its suggestions, the application and suggestions are referred back to the municipality to determine if it meets the land bylaws. Again, a permit may be issued and may also specify conditions. Municipalities may also refer development applications to Regional Health Authorities and other agencies for their comments. The municipality has the sole authority for accepting or rejecting an application for development.

The applicant or affected persons who feel negatively impacted by a decision made by a municipality can appeal to the Development Appeal Board. The Board will either approve the application or refuse it. Should a party wish to pursue the decision further, then they must appeal

to the Alberta Court of Appeal. This ruling will consider the procedures only (i.e. it is reviewed on questions of law or jurisdiction) and not the individual application details.

The Agricultural Operation Practices Act provides the framework for conflict resolution between

farmers and other residents. Any producer that uses generally acceptable practices (as outline in the Code of Practice) and is not contravening land use bylaws are not liable in a nuisance lawsuit and further cannot be prevented from continuing their operation even if it creates a nuisance. The onus of proof is on the complainant. Alberta Agriculture, Food and Rural Development coordinates the peer review process which is used to resolve nuisance conflicts.

3. Saskatchewan

Certain classes of intensive livestock operations must obtain approval for waste storage and waste management plans under the intensive livestock provisions of the Agricultural Operations Act in order to protect against surface and groundwater pollution. This Act also protects farmers from nuisance lawsuits and provides a mechanism for dispute resolution between the farmer and his neighbors.

An intensive livestock operation is any confining of animals where space per animal unit is less than 370 square metres. Approval is required for any intensive livestock operation that:

- Has an earthen manure storage area or lagoon,
- Involves rearing, confining or feed of 300 or more animal units, and
- Confines more than 20 animal units but less than 300 for more than ten days in any thirty day period within 300 metres of surface water or 30 metres of a domestic water well.

Saskatchewan Agriculture and Food (SAF) conducts the environmental review and involves other agencies, including Saskatchewan Environment and Resource Management, Saskatchewan Health, SaskWater, Saskatchewan Municipal Government and local municipalities.

Applicants can consult with SAF to determine the information required to prepare their application. Applications are submitted to SAF and Agricultural Operations field staff for the initial technical review and to ensure completeness. Field staff conduct a site inspection and prepare a covering report. The application may be returned to the applicant for further information. The covering report identifies any local issues such as a summary of the public process, previous approvals issued and the proximity to other intensive livestock operations and a description of any unique features. The application is then sent to the head office in Regina for evaluation and referrals to other agencies.

As part of the process to SAF approval, applicants must complete a workbook requiring a description of the animals, manure production, storage and utilization, nitrogen, phosphate and potassium production, nitrogen utilization, areas available for manure spreading and management of dead animals. The idea is to help the farmer balance nutrient production with crop usage and determine the size of the manure handling facility required. Besides completing

the workbook, the farmer must undertake a geo-technical investigation at the proposed site to ensure the soil and proposed crops are suitable for the amount and types of nutrients in the manure.

SAF and the referral agencies identify any potential pollution risks, identify any regulatory requirements their agency may have, determine the adequacy of any steps and/or monitoring procedures proposed (if any) and identify any environmental concerns not addressed in the application. SAF and the referral agencies consider:

- The proximity to any water resources
- The completeness of the geo-technical investigation of the site
- Soil conditions
- Adequacy of the storage design
- Adequacy of the dead stock management plan
- The nutrient balance of the manure management plan
- The acres required (both long-term requirements and annual requirements) to use the manure as a fertilizer.

Referral agencies are to respond within 40 days with a decision usually made within 10 days of receipt of the referral replies.

SAF may approve, refuse or request additional information. If approved, special conditions may be required regarding the exclusion of manure spreading areas, requirements for monitoring, minimum standards for manure storage construction or any other action considered necessary for water protection.

Under the Saskatchewan Planning and Development Act, rural municipalities have the authority to develop zoning bylaws governing all types of development within the municipality, including intensive livestock operations. Most municipalities require one or more of the following:

- Development or discretionary use permits for establishing or expanding livestock operations
- Advertising and approval of zoning changes
- Input to sub-division approvals and sub-division servicing agreements
- Road maintenance cost agreements for heavy traffic on municipal roads
- Building setback distance from roads
- If within a planning district, the recommendation of the planning district.

4. Ontario

The Ontario Environmental Bill of Rights gives the public the means to ensure that the goals of environmental protection and conservation are achieved by the provincial government in an effective, timely and fair manner. It sets out minimum levels of public participation respecting government decisions on environmental matters and allows the public to request the review of environmental policies, acts, regulations or instruments.

Farmers are also subject to the Environmental Protection Act and the Ontario Water Resources Act. The Ministry of the Environment has the lead role for these two pieces of legislation. Any two persons resident in Ontario who believe that a prescribed Act, regulation or instrument has been contravened may apply in writing to the Environmental Commissioner for investigation.

The Environmental Commissioner has ten days to refer the application for review to the appropriate ministries. Should pollution have occurred, enforcement of the appropriate legislation is initiated. Any person who causes contamination in addition to fines/jail time (for first offence by an individual a fine of not more than $20,000/day; for a second offence a fine of not more than $50,000/day and or not more than one year in jail. For a corporation, first conviction a fine of not more than $100,000/day, for subsequent convictions a fine of not more than $200,000/day) may be ordered to repair the damage, prevent the damage, and if it could damage or endanger water supplies, provide alternate water supplies.

The "Best Management Practices" Guidelines book is an educational package designed to assist the producer in siting and managing his intensive livestock operation. It also forms the guidelines to identifying normal farm practice under the conflict resolution process of the Farming and Food Production Protection Act.

As a result of growing conflicts between farmers and neighbors, the Farming and Food Production Protection Act was passed in 1994. This legislation is designed to protect farmers from nuisance lawsuits or court injunctions resulting from normal farm practices. One of the controversial issues discussed during the introduction of this Act was how to balance the interests of the public and environmental groups and the rights of producers to farm. As a result, the Act states that "no municipal bylaw applies to restrict normal farm practice carried on as part of an agricultural operation". A board appointed by the Minister of Agriculture hears complaints and rules as to whether or not the disturbance results from a normal farm practice. They respond in writing to all parties. The Board can also recommend changes to the farming practice within a specific timeframe. The onus is on the plaintiff to prove contravention.

Ontario municipalities can create bylaws under the Municipal Act and the Planning Act regulating issues affecting health, land use and building construction. Buildings must also meet the structural adequacy requirements under the Ontario Building Code. Municipalities use three ways to control development:

- The use must be a permitted use under the zoning,
- The site must keep some minimum distance from other land uses such as residential areas;
- There must be a nutrient management plan and adequate manure storage (at least 240 days storage is the current recommended practice) prior to issuing a building permit.

Municipalities, through zoning, determine where and if development will occur. Bylaws vary between counties and often within counties at the township level.

Ontario is to table new legislation in the fall of 2000 that would clearly define the roles and responsibilities of the province and the municipality regarding nutrient management. The improved approach will:

- Develop a uniform, enforceable policy requiring all nutrient users to create and implement nutrient management plans (NMP). This would be phased in, focusing on intensive livestock operations first (within 5 years) followed by all nutrient users within 10 years.

- Develop categories of agricultural operations, which would require different levels of approval at the municipal level:
  - Farm category #1 (<150 AU): Minimum Distance Separations (MDS) required; NMP required but kept on file at home.
  - Farm category #2 (150 to 450 AU): NMP required and third-party reviewed; MDS required; adequate manure storage capacity required.
  - Farm category #3 (over 450 AU): Intensive Agricultural Operations' Certificate required. Components of the certificate include NMP, MDS, engineered plans, soils investigation of site, use of landscaping around site; in some instances their could be provision for other approaches such as odor reduction technology.
  - Farm category #4 other agricultural operations.

- If a farmers is applying manure to land which he does not own, a third-party review of the NMP will be required.
- The province will coordinate all third-party reviews of various documents prior to the construction.
- The province will develop and implement guidelines for the management of nutrients.
- The Ministry of Environment will continue to prosecute offenders. But, upper tier municipalities should be given clear authority to enforce NMP issues that do not violate provincial or federal legislation. Enforcement and auditing of NMPs is critical. The task force studying the issue recommended that some features of the Ontario Grower Pesticide Safety Program be used to enhance the auditing.
- Advisory committees comprised of broad community representation be established to help municipalities in informing farmers, mediating complaints and giving advice but not for enforcement.
- There is need for more education and awareness programs for all parties.

5. Quebec

The Regulation for the Reduction of Pollution from Agricultural Sources (new regulations in 1998) is intended to protect water and soil quality through stricter provisions on the application of manure after October 1st of each year. Application of nutrients to phosphorous-rich soils and separation distances ("protected zones") between watercourses and farm activities and structures are the focus of the regulation. In addition to a requirement for operating permits (retained from previous regulations), producers must prepare a nutrient management plan (plan agro-environmental de fertilization or PAEF) for the storage and application of manure, compost and chemical fertilizers, specifying the appropriate periods and amounts of application. For producers or manure management firms that transport manure to other sites, an annual log must be kept on the source, quantity and date of the shipment and the name of the recipient. Manure

"export" and "import" manifests are subject to audit by the Ministry of Environment and Wildlife (MEF).

Specific provisions of the regulation include:

- The minimum storage capacity is 200 days for facilities built before July 30, 1997 and 250 days for newer structures.
- As of October 1, 1998, the application of nutrients to the soil is prohibited between October 1 and March 31 unless the producer has a PAEF with such practices approved by the MEF.
- As of December 1, 1998, the application of phosphorous from chemical fertilizers to soils that have high or excessive levels of phosphorous must not exceed crop requirements and measures to reduce phosphorous in these soils must be included in the PAEF.

Operations must be granted an authorization permit in advance by the MEF for all proposed changes in production that result in an increase in the amount of manure generated. These changes include the construction of new barns, modification to an existing barn to increase capacity, an increase in the number of animal units and a shift from a solid to a liquid manure management system.

Municipal regulations have been used to limit growth in Quebec by imposing four types of restrictions: production zoning, enhanced separation distances beyond the provincial standards set in regulation, buffer zoning around urban development and enhanced limits on the number of animal units per operation.

The Quebec government has developed an environmental action plan for 1998 to 2003 with the general objective to have by 2005 some 20,000 farms or nearly 90% of the agricultural activity adopt agricultural practices on the storage and management of manure, the management of fertilizers, the conservation of soils and protection of water and the use of pesticides. In 2000, the government visited 88% of the farms to collect information on the farms, individual regions, water basins contaminated by manure, etc. The information from these visits was compiled to develop an agro-environmental portrait of Quebec farms. Under the Prime-Vert program more than 1,000 storage facilities for manure were built in 1999/2000 compared to 543 in the previous years. The Quebec Government feels that this program has addressed 70% of the manure storage problems and more than 98% of the pork industry. The remaining problems are associated with small farming operations. Increased attention will be focused on these smaller operations.

By 2003, all farms will be required to have well-sealed and adequate manure storage to address issues concerning odor and the loss of manure elements. Management of manure in an agro-environmental plan will be directed by regulation. Pesticide use is to be reduced by 59% (based on 1992 usage) by 2003. An environmental accreditation system will be in place in 2005 with the procedures and criteria of the system to be identified by 2003. Specialized counseling services continue to play an important role with regional coordination a key to effective

management. By 2005, the will be an established process to disseminate information on agro-environmental practices for agricultural businesses.

6. New Brunswick

The Clean Environment Act, the Clean Water Act and the Health Act can also impact land use. Manure cannot be spread within the setback distances established for Designated Watersheds under Section 14 of the Clean Water Act. Manure cannot be spread on land within 75 metres of a private well or drinking water supply other than that of the owner. Dead animals are to be handled and disposed of as legislated under the Health Act.

The Agricultural Land Protection and Development Act promotes and facilitates the stewardship, protection and improvement of agricultural land. Under this Act, producers can apply to register their land as zoned for agricultural use. This Act also allows regulations to be established on the setbacks between livestock facilities situated on registered agricultural land and adjacent lands.

The Livestock Operations Act requires the licensing of all livestock operations. To obtain a license, the producer must satisfy the Registrar that they have appropriate separation distances from neighboring dwellings, watercourses and other environmentally sensitive areas, have taken measures to minimize the spread of disease to other livestock operations, have an effective storage system and adhere to a manure management plan approved by the Registrar. The license specifies the maximum number of livestock. This number cannot be exceeded without applying for a new license. Licenses are valid for five years or for a shorter period of time, if the Registrar so specifies. They must be on display at the facility.

The Livestock Operations Appeal Board hears appeals of decisions made by the Registrar. The Appeal Board may either accept or reject the Registrar's decision based on its review of the application and the hearing. Inspectors can on demand ask to inspect the facility, the records or seize any records, documents or books. Penalties for violations are set out in the Provincial Offences Procedure Act.

The Manure Management Guidelines for New Brunswick were developed in 1996 in consultation with government agencies and farm organizations. These guidelines include land-based standards for the siting of new livestock facilities or the expansion of existing facilities and outline practical alternatives to manure storage and land application techniques that will reduce the potential for odor nuisance and environmental risks. The recommended minimum storage capacity is 210 days. Manure storage facilities must be approved by the Department of Agriculture and Rural Development prior to commencing construction of any of the livestock operation.

Producers are required to obtain a Certificate of Compliance if they are applying for any government loans or assistance. This certificate is an evaluation of the livestock production unit, its manure management procedures and the quality of the management. Certificates are issued to

all producers whose practices adhere to the provisions and recommendations of the Manure Management Guidelines.

Under the New Brunswick Agricultural Operations Practices Act of 1999, producers are protected from nuisance lawsuits provided that they conform to acceptable farming practices. The Farm Practices Review Board receives written complaints, investigates and rules on the application. The Board may also try to act as a mediator to resolve any disputes.

7. Nova Scotia

Livestock producers are protected against charges of nuisance under the Agricultural Operations Protection Act of 1986, if they follow generally accepted farming practices. Upon receipt of notice, the Minister of Agriculture must establish a committee to investigate the complaint and determine if the practice is generally accepted. The committee will report on the appropriate remedial action, should the operation have failed to use such practices.

The Nova Scotia Department of Agriculture and Marketing has established Guidelines for the Management and Use of Animal Manure. Key components of these guidelines include recommendations for storage, spreading and management.

The Nova Scotia Environmental Protection Act is designed to support and promote the protection, enhancement and prudent use of the environment. This legislation does not apply to "accepted ordinary activities" of farms.

Recently, a non-government advisory committee was established to conduct a thorough review of the Environment Act. This review process resulted in more than one hundred written submissions and the preparation of a committee report in July of 2000. The report included recommended amendments to the legislation for further consideration by the Minister. These recommendations included providing greater clarity to sections of the act, strengthening the enforcement provisions, promoting compliance through industry groups and self-regulation, more auditing to ensure the environment is protected and more effective use of the principle that the polluter pay.

Municipalities have the authority to develop regulations affecting land use, zoning and building construction.

8. Prince Edward Island

There are a number of sections of the Environmental Protection Act that are relevant to livestock producers. Producers cannot establish a waste management system without obtaining written approval from the Minister, may not contaminate the environment and are responsible for the repair and restoration of any environmental damage they cause.

9. Newfoundland

Municipalities are largely responsible for land use regulations. Permits are needed for most development proposals. A general requirement is that a new livestock production unit must be located at least 610 metres from existing operations.

HOOP STRUCTURES

Heather Gregory, Pivotal Plus Consulting Ltd.

1. Introduction

Animal welfare is shifting from being a matter of personal ethics to one of societal ethics. This shift is making leaders in the livestock industry more accountable for the manner in which their animals are cared for. How we define animal welfare will impact how we assess that welfare and what features industry incorporates into its new production systems.

The British Brambell Committee in 1965 suggested that animals need companionship, freedom of movement, adequate food and water and should be provided with appropriate temperatures and lighting. The Farm Animal Welfare Council of the United Kingdom has adopted a more comprehensive set of criteria. One of the more controversial practices in hog production has been the use of individual stalls for pregnant sows. The increased demand for animal welfare has now changed the methods used in group housing of sows in many European Union countries. Britain banned gestation stalls in 1990 with a seven-year transition period. Other countries such as The Netherlands banned the stalls in 1998. Denmark restricted use of the stalls to four weeks following breeding. No jurisdiction in North America has banned gestation stalls.

As consumers press governments to make animal welfare an issue, exporting countries will have to reassess how they raise their animals. Countries may face restrictions in the form of compulsory labeling identifying how the animal was raised, or be totally eliminated from the marketplace if their commodities not raised according to the animal welfare rules enforced in the importing country. The possibility of these restrictions is quickly becoming a reality.

One popular and economical answer to the confinement housing traditionally seen in hog operations is the new group housing systems. The following section provides a brief description of the "hoop" shelters and discusses the advantages and disadvantages associated with them.

2. Description

The hoop shelter is a quonset-shaped, non-insulated building approximately 30 feet wide by 80 feet long with each end opened to allow natural ventilation. Its tubular steel arches are attached to support posts (usually 6" x 6" posts) with a polypropylene tarp stretched over the hoops. Some hoop barn owners have reported 15 or more years of use from one tarp, if it's kept tight and properly maintained. The lower part of the sidewalls as well as the endwalls or gates are usually planking, such as plywood, about four to five feet in height. The barns have dirt floors but the front end has a concrete pad of about 18-25 feet in length. Cost estimates for the barn with construction and the water lines trenched into place is about $13,000 to $15,000. As the feed stalls are the most expensive component of the system, barns could be set up to have a single feeding area serving more than one shelter. This would further reduce the cost of the structure on a per hog basis.

These hoop shelters can be used for feeding hogs or as housing for pregnant sows. For a feeder hog operation, one end of the shelter has a concrete pad and holds the feeders and waters as well as an area for sorting and locating a weight scale. A shelter 30 feet by 72 feet can house 170 to 180 feeder pigs comfortably without crowding.

For housing for pregnant sows, the barn has a feeding area on concrete but subdivides the dirt portion of the shelter into two animal holding/lounging areas. A group of 24 to 30 gilts can be housed in a 721 square foot area of a hoop shelter. A 30 foot by 72 foot shelter could therefore house 75 to 90 sows.

Usually shelters are sited on an east-west axis to protect the open ends from the prevailing cold winter winds. In the winter, the ends of the shelter may be partially closed except for about three to five feet along the top. At other sites, producers may want to situate on a north-south axis to take advantage of prevailing winds in the hot summer months.

3. Advantages

Lower capital costs

These outdoor systems are 25% to 33% of the cost of conventional systems. Conventional barns will last 20 years in an industry that re-invents itself every three to five years. Small and medium sized producers are assuming a great risk and substantial financing charges in this highly dynamic market. Producers are searching for alternatives to reduce these fixed costs. Reports suggest that producers who have a cheap source of bedding, produce their own feed and handle their own manure disposal would face operating costs at least as economical or better than the confinement system.

Increased flexibility

Facilities can be salvaged for use as a storage facility for equipment, for grain storage or for cattle should the pork market suffer a downturn. Producers have the ability to wait out a market downturn. From a producer's point of view, this is an advantage. From a processor's point of view, this can result in a less consistent supply of hogs.

Ease of construction

Facilities are easy to construct in short timeframes compared to conventional barns.

Improved movement for livestock

More movement means fewer incidences of leg problems. Studies have suggested that after eight gestations, sows housed in confinement have bone strength 30% less than sows housed in hoop barns. Other advantages associated with increased movement are: sows have a shorter labor during farrowing, less frustration among the animals as they are able to perform a motivated (natural) behavior and lower culling rates. This latter point should result in lower

replacement costs compared to the 40% to 50% culling rates experienced in confinement operations.

Other improved health aspects

These structures have the potential to achieve more uniform immunity within the adult population in that the young piglets receive good levels of colostral protection from their mother against diseases that are endemic within the herd into which they are born. There is also less chance of major disease outbreaks. Current densely populated confinement systems create opportunities for large-scale outbreaks of infectious diseases and the need for mass destruction of infected animals. Less dense population takes into account the consequences for both animals and people.

Pigs reared in hoop structures also have healthier lungs. Post-slaughter evaluations reported in the University of Manitoba study indicated that 90% or more of the lungs of pigs from hoop structures were clean or had only minor lesions compared to 70% for conventional housed pigs.

Less aggression

Sows in groups normally have less fear than sows in stalls and this has a positive effect on reproductive performance. It should be noted that changes in group composition could encourage aggression. The more stable the group, the less the aggression. Having a separate area for feeding and the availability of straw for the hogs to forage also reduce aggression.

Energy costs

Minimal energy is used. Animal heat keeps the watering bowls from freezing in cold weather. The bedding that is continually topped up until the hogs are removed provides a place for the hogs to burrow when it is cold. Composing manure actually serves as a source of heat. There is no requirement for supplemental heating, mechanical ventilation or lighting.

Environmentally sound

Composting of the straw and the manure keeps the odor down and is more environmentally friendly than slurry systems that have the potential to leak and are susceptible to human error. Some authorities are now wondering what will happen to the hog manure pits and lagoons when these operations shut down. Land application of the manure also involves less odor.

Lower municipal taxes and insurance costs

Some municipalities assess lower taxes for these structures compared to conventional housing. In addition, because the structures cost less, they cost less to insure.

4. Disadvantages

Increased use of feed

Estimates range from 5% to up to 20% more feed consumption depending on weather conditions (note: most studies suggest 5% to 10%). When it's cold, pigs eat more and when it's hot they eat less. Producers recognize that they trade off less fixed costs for more feed costs. This is less of an issue when feed costs are low. There is some suggestion in studies done by the University of Manitoba that the hoop sheltered hogs show poorer performance in the grower phase but rebound in the finisher phase so that the overall average daily gain and days to market were similar between the shelter and conventionally housed pigs. Carcass yields and indices were also similar. In the summer, the improved feed efficiency favored the hoop structure.

Need for more management

Some studies have indicated that in the beginning more labor was required to monitor and tend the stock. There may be more difficulty in locating and identifying particular sows in groups, necessitating more labor associated with handling and sorting the pigs. However, as producers become more familiar with the system, the labor requirement declines.

Need for individualized feeding

Dominant sows bully others and this can result in either under or over feeding with greater variation in body condition within the sow herd. Separation of the dominant sows from the group can prevent this. Small groups fed by trickle or liquid feeding systems appear to suffer this problem less frequently. The use of feeding stalls and electronic feeders are ways to provide individualized feeding and to overcome routine aggression. Ample feeder space (5-10 pigs per space) and adequate drinking spaces (4-6 total) are important.

Initially high replacement of stock

Sows that have spent their entire life in confinement will find it difficult if not impossible to adapt to group management. A higher replacement rate of gilts will be required during the transition period. Selection pressure will focus on animals that work well in group housing systems outdoors rather than those animals that accept total inactivity. The University of Manitoba has suggested that replacement rates for breeding sows will be less for hoop shelters over time due to lower culling levels.

Greater health management requirements

Some studies have reported a higher incidence of arthritis in pigs kept in hoop housing. Lincomycin will reduce the incidence. Diseases that are carried on the tonsils and spread by nose contact increase exponentially with the number of pigs. Some studies suggested that there is a higher frequency of mastitis, metritis and agalactia. Vulva biting has also been reported as a

problem but other studies have found that removal of the aggressors or a separate feeding area reduces this. Separate shelters to house sick animals results in better use of existing facilities. Relative humidity in the winter can be high. It is important not to create serious humidity problems by closing off the shelter too much from the fresh air.

5. Other Factors

Studies have indicated that the reproductive performance is similar for gilts and sows whether or not they are housed in a barn or a shelter during pregnancy. Analysis by the University of Manitoba suggested that sheltered sows have slightly larger litter sizes and wean heavier piglets but the difference was not statistically significant. Sow weight, back fat and body condition were similar between the housing types. Mortality rates were generally 2% or lower and were comparable for both types of housing system.

6. Cost Estimates

Using the Manitoba Agriculture farrow-finish guidelines for March 1999 as the basis, one can estimate the impact of the additional feed costs versus lower capital costs.

In terms of fixed costs for a conventional barn relative to a hoop structure, the appropriate fixed costs identified (excluding the feed mill) were:

Grower finisher barn	$297,940
Finishing barn equipment	$242,338
Total cost of conventional barn	$540,278 for 2120 pig spaces

Cost of hoop structure 2120/175 or 12 x $15,000 = $180,000 or 1/3 of conventional barn.

Sow barn	$369,194
Sow barn equipment	$333,025
Total cost of conventional sow barn	$702,219 for 300 sows

Cost of hoop structure 300/75 or 4 barns x $15,000 = $60,000 or about 10% of a conventional barn.

Total cost	Hoop structure	$240,000
	Conventional barn	$1,242,497

The hoop structure costs approximately 20% of the cost of the combined sow barn and grower-finisher barns.

For a farrow-to-finish operation fixed costs for a conventional operation are $21.57/pig sold. For a hoop structure, the fixed cost would be $4.32/pig sold - a difference of $17.25/pig sold.

Total feed costs identified in the budget were $63.52/pig sold. Applying the high end of the estimate of increased feed costs, i.e. 20%, would give an increased cost of feed of $12.70/pig

sold. The difference between the fixed cost savings ($17.25/pig sold) and the maximum higher cost of feed ($12.70/pig sold) is $4.55/pig sold.

Total labor cost identified in the budget is $16.34/pig sold. Studies have suggested that hoop structures require additional labor. Applying the savings of $4.55/pig sold after consideration of the fixed and feed costs components to the budget amount would imply that labor costs would have to increase 28% to offset the savings realized from the hoop structure. This 28% increase would mean that the additional labor would have to be about 38 hours/week beyond the 135 hours/week identified in the conventional barns.

REPORT ON RESEARCH ROUND TABLES
August 30 – September 1 2000

Dr. Ross Bulley, Consultant

This report is based on my observations of the four half day sessions that I attended in Winnipeg with the Livestock Stewardship Panel, and representatives of government, academia, and industry. In addition it contains some observations based on my own experience that may assist the Panel in its deliberations. The primary focus is on water quality and air quality, with some brief general observations on manure management and monitoring and information systems.

1. Water Quality

1.1 General Comments

The main concerns related to intensive livestock operations and water quality usually fall into the following categories: the potential environmental degradation of water resulting from the addition of nitrogen (ammonium, nitrate, or organic-N), phosphorus (organic-P and ortho-P), potassium, pathogens, or heavy metals.

1.2 Location of Concern

Contamination of groundwater

- **Seepage from earthen storages** - Concerns related to earthen manure storages have normally been centered around the seepage of nitrogen and phosphorus compounds to groundwater. This can occur as water seeps through the storage wall and with it, nitrogen and other soluble inorganic ions (e.g. chloride) and solids. If the storage has a good fabric liner, this is normally not a concern. If it has a properly designed clay liner, the infiltration rate is very slow and the rate of transfer is extremely low. Even with this very slow rate of movement, since there is no appreciable movement of organic compounds and there is no nitrate nitrogen in a storage, the soluble ions such as chloride and ammonium are the only compounds that leave the storage. But ammonium ions bind onto clay particles and soil particles and their movement will be very slow. I think after hearing the research results of the work of Ranjan Sri Ranjan and Bob Betcher, I feel that the earthen storages are now quite safe when properly designed and properly managed. Mismanagement leading to breaking of the clay liner on the bottom or the sides can raise some concerns. But since the research also points to the evidence that a layer of manure solids normally forms in the bottom of the storage and reduces the infiltration rate through the storage walls, this provides some additional confidence. Note: Even with all of the above, people are concerned about earthen storages and good PR about the

difference between old poorly designed storages and new, properly designed storages will have to be made or go with a requirement for fabric liners on all storages.

- **Seepage of water through the soil on manured fields** - The main concern related to seepage to groundwater from manured fields relates to the movement of nitrate nitrogen, ortho phosphate, potassium or chloride ions, or pathogens. As far as I know, potassium and chloride are not of concern in Manitoba. I have not seen any research that indicates there is movement of pathogens through soil to groundwater. Possibly on very shallow sandy soils or through large cracks? But I have not seen any scientific evidence. Soils have a large capacity to bind phosphorus. If enough phosphorus is added to the soil, the binding capacity can be filled and the phosphate ions could begin to move downward in the soil. Of course once the ions reach groundwater and begin to move laterally, they will encounter more soils and again be bound. This would appear to indicate that the problem is minor. But, to ensure a long term sustainable basis for Manitoba, there should be some long term monitoring of selected soils and if the phosphate levels begin to rise to levels where there is any concern, then the manure application rates could be changed from nitrogen based application rates to phosphorus based application rates. Phosphorus based application rates could be a standard practice anyway since they may optimize the utilization of the nutrients in the manure, but that is a different issue.

- **Seepage from water passing through or over cattle pens** - Since manure packs may or may not be aerobic depending on depth and age, the water passing through a pack may contain nitrate nitrogen which can and will travel with the water through soil to groundwater or move with overland flow to surface water. I have seen very little information about the magnitude of this problem but the people in Alberta may have good information on it. A catchment basin designed to handle any runoff from the pack could greatly reduce this problem. But infiltration through the pack or at the edges?

- **Seepage of water to groundwater from cows in holding areas around buildings, e.g. dairy cow outdoor holding areas** - Same comments here as for previous item.

Contamination of surface waters

- **Surface runoff from manured fields** - Same comments will apply to fields receiving inorganic fertilizer or even just agronomic fields- once the land is cleared, nutrients in runoff will be different. To limit the possible effects of nutrient movement with surface runoff, setbacks from ditches and streams, grass buffer strips and even catchment basins can be created. The manure management guidelines contain recommendations for setbacks and, I believe, the width of buffer strips. I have not seen any published research appropriate to Manitoba conditions that puts these setbacks and buffers in question. But any surface runoff will contain soluble nutrients and particulates with phosphorus adsorbed onto the surface. This runoff whether it is from freshly cleared land, land fertilized with inorganic or organic based fertilizers or those fertilized with manure will

potentially contain solids and nutrients of concern to freshwater ecosystems. This may be the price we must pay for tilling the land. The question becomes, would fields receiving manure contribute more nutrients and particulates in their runoff than fields fertilized with inorganic fertilizers. Other than immediately after application, it may be that fields

receiving a regular application of manure have a better soil organic matter content and tilth and thus retain nutrients better that a field that only receives inorganic fertilizers. I really don't know. If you feel it is important, talk to Dave Burton. The problem associated with the Red River flood plain is interesting. Whether the manure enters the river during flooding directly from flooded storages or from the fields after recent manure applications is not very different. But if all livestock were banned from the flood plain and all nutrient additions were from inorganic fertilizer, would it be better? Probably yes since the inorganic fertilizers can be placed right in the soils and the majority would probably be placed after any chance of a flood but I don't have a feel for the extent of the difference. Superimposed on this of course is the relative significance of the contribution of nutrients to the flood waters from the storages relative to the sewage lagoons in the same area. For those areas with septic fields, the contribution from the fields could exist but would still be less due to the soils filtering capacity. Pathogens transfer from both manure storage and sewage lagoons to flood waters would be a problem but when floods do occur, I only recall concerns from human sewage and not manure storages but I could easily have missed it.

- **Surface runoff from holding areas for beef and dairy cattle** - The management of surface runoff from holding areas is much the same as for manured fields but normally much easier. The area is normally smaller and better defined and the surface runoff can be moved and held in a catchment area if needed and eventually applied back to the land. There are also research programs looking at the use of artificial wetlands for treating this type of waste. They certainly look as though they have a real potential for treating relatively dilute waste water during the summer months (not year round). I don't support their use for treating livestock wastes. I can give my reasons for my views if wetlands are being considered in your deliberations.

- **Areas where cattle have direct access to fresh water or overwintering areas on frozen lakes** - Any area where cattle are over wintered on lakes or rivers or where they have direct access to streams for watering will receive a significant nutrient input from the cattle. If you want to reduce the possible impact from the cattle, direct access must be removed.

1.3 Research Priorities

- Some additional work on the potential movement of nutrients from earthen storages should be carried out to finish off the work that was initiated. (e.g. possibly on porous spoils, or for improperly managed older earthen storages, or newer properly designed storages but where the clay lining has inadvertently been breached. (It will happen so find out the impact before it happens).

- The simulation model being developed at the University by Dr. Sri Ranjan could provide a tool especially useful for looking at "what ifs". If we apply in the spring vs the early or late fall, if we apply a heavy application once every two years and then a light dressing in the odd year etc. Although the model might at some time be of value for on farm use,

  variations in rainfall rate, timing, variations in soil type over a field and with depth etc. may limit its usefulness as a farmer aid for designing yearly applications.

- When new nutrient on farm monitoring equipment becomes available on the market, someone needs to carry out a careful study as to its reliability for use on farms and by farm workers in the field. Bad information or workers who take the results as absolute instead of understanding that the results are plus or minus 25% or ? can be a real problem.

- What is the real effect of the application of manure to soils on the quality of the water which leaves the field during spring runoff or floods and arrives at the receiving waters (e.g. rivers, lakes). Example of Research Programs: Compare the water quality in spring runoff for identical fields that have two or three different crop types and: a) have been tilled in the fall but had no cover crop (still happens?), b) field with a cover crop, c) manure was applied at recommended rates in the fall, d) manure at recommended rates was applied in the spring but before a major rainfall event, e) manure was applied to the snow covered surface in the winter, f) manure was injected into the soil in the fall, g) fertilizer was broadcast vs injected at the recommended rate, etc. How do these affect the water quality of surface runoff? This would be a big study and in my view really should not decide the expansion or stopping of growth for livestock. The results are really needed for improving the decision making process for managing livestock wastes. Good management practices can reduce or minimize many of the potential impacts of the above.

2. Air Quality

2.1 General Comments

Air quality issues split into several separate issues:

- In barn air quality: worker health and safety, dust, potentially harmful gases (hydrogen sulphide or ammonia gas), pathogen transport, odors, animal health and safety, dust, potentially harmful gases, and disease transfer animal to animal.

- Quality of the air at the property line: odor transport to neighbors from point sources (barn exhaust vents and from possible treatment systems such as aeration, composting, biogas generators, etc.) to non point sources (storage and during and after land spreading), and pathogen transport.

2.2 In barn air quality

For livestock, the design of barns is continually being improved to provide the best air quality to optimize growth of the livestock. That increases income and everyone is happy. The lower the

dust, the lower ammonia and hydrogen sulphide levels, the better the animal health and growth rates. Work is ongoing to reduce the time manure is in the building and improving the quality of flush waters used to remove the manure. All of these items are for newer barns and will not only improve the interior environment for livestock but it improves the environment for workers an improves the quality of the exhaust air from the barns. I am not sure what can or should be done for older barns which may still have outdated exhaust ventilation systems, poor manure handling systems and as a result poor in barn air quality. I am sure Ken Blahy can bring you up to date as to the extent of the concern re worker heath as to whether it is all talk but no reports or that there are reported cases and cause for real concern in older barns and even in newer barns. What was the incidence of worker respiratory illnesses over the past 20 years and has it improved for workers in the newer barns? On a similar note, has pig performance and health improved as a result of the new barns? Is there still a real disease problem and is there a real concern about possible transfer of pathogens from pigs to workers? Ernie Barber should be able to shed some light on these questions.

For all barns, new or old, if research shows that there is still a problem with dust, my own view is that the owner of the barn is responsible for providing a safe working environment. It may be possible to provide it by better ventilation design and management practices or providing personal air filtration systems for workers and require that they be worn. The latter won't help the animals but worker health has an even higher priority.

At the meetings, there was very little discussion on barn air quality for poultry and dairy. I know that dairy farmers are continually working on air ventilation design and air quality in their barns and so I would expect continuing improvements but I do not know of progress in the poultry industry. They may be making good progress, I am just not familiar with it.

2.3 Quality of air at the property line

The possible transport of dust, pathogens, gases and odors are the main concerns of neighbors when they perceive that there will be a decline in air quality due to livestock operations. I do not feel that dust nor pathogen transport through the air is of major concern. Farm practices generate dust along with many other practices and I don't think it is a major item. The majority of the literature that I have read indicates that pathogens that might be transferred through the air in aerosols are killed very quickly in an aerobic environment reducing the risk of disease transmission in this manner. As well, the use of big guns and other manure spreading methods that throw the manure into the air during application are being phased out and their use is declining. They were the main source of concern for pathogen transport through the air. The engineers managing sewage treatment systems have been looking at this for a long time and there is very little evidence for the long range transfer of diseases through the air.

The transfer of odors is a different problem. The main sources of odors are: 1) barn air, 2) storages, 3) during and after the spreading of manure on land and 4) manure treatment systems. For newer barns, air quality and as a result odor generation is being reduced and I feel is now of lesser concern. Older barns may still generate offensive odors but changes in manure

management practices (more frequent cleaning etc) and ventilation systems would improve the barn air quality. But at what cost? Using covered storages (i.e. concrete) is very costly or storages for which a temporary, removable cover (straw or fabric) is used appears to be a very effective way for reducing odors generated from storages. Again, this may be more possible for the newer systems but, if expansion is the main concern, then newer systems have the technology to control odors from their storages if there is a concern at their location. The application of manure to land through injection systems, surface application to land with rapid incorporation also seems to have great potential for reducing odors during land spreading.

There are management practices that can also reduce the odor problems that are of concern to neighbors related to odors generated at the time of spreading. These are all documented but some farmers choose not to use them. Some examples of practices include: Apply manure only during the spring and or the fall; odors once or twice a year may be tolerated, but every week is a much greater problem. Apply at a time when the wind is in a favorable direction relative to the transfer of odors to a possible problem area. Don't apply on the weekend in the summer or even during the afternoon and evening in the summer if possible. There are many other items like this but it is just good farm practices which can reduce farm- neighbor conflict.

But even with all of the care that is possible, people will be concerned about odors. Everyone has driven down a highway, or visited friends when a farmer near by has been spreading and there are problems. Whether these farms are using big gun application methods or spreading and not incorporating, doesn't matter, for many people, odor will always be a concern. Because of this, anything which will either reduce the generation of odors, reduce the release of odors from building, storages or after application to land would be of help.

Management practices that have been tried or are under investigation:

- Additives to manure which reduce odor and are cost effective: None known at this time.
- Additives to feed which reduce the odors from manure: Sam Baidoo did some work on this with artichoke but I have not seen the results. Qiang Zhang may have seen the results or know of other work.
- Aeration of manure: If you keep manure in an aerobic state it is essentially odor free and has an earthy smel - great but very costly. Composting is also a form of aerobic treatment. After composting, the manure is essentially odor free and can be stored and applied to land with little odor. But it is time consuming, and not a simple process if done properly and may not be the easiest and cheapest way to control odor. But it is effective.
- The use of masking agents: Covering the smell with another odorous compound has not been proven effective for the control of manure odors..
- Counteractants: These are chemicals which actually combine with the chemical that is causing the smell and neutralize it. Some of these are popular with chemical companies

since their odor problems may be a result of one or possibly two chemicals. But for odors from animal wastes, the odor is a result of many compounds and nothing that has been tried that I have seen in the literature has been effective. Kiang Sham might know whether there have been any recent successes in Idaho or anywhere else in the USA.

2.4 Odor Measurement

One of the biggest problems with odor is our inability to measure its strength and quality quickly and cheaply. Although a lot of research on odors is devoted to odor quality (i.e. Is it pleasant, bad, acceptable etc), my experience has been if you can tell that it is from swine or poultry manure, it is bad. Dairy and beef are not nearly as bad. The measure of odor strength is also very difficult, time consuming and costly. Dr. Kiang Zhang in Biosystems Engineering has an odor research lab with a dynamic dilution olfactometer. The olfactometer is currently the most reliable method of quantifying odor strength. But going to a farm, collecting gas samples in large tedlar bags, returning to the lab and presenting samples of the odorous air from each bag to a panel of 8 or more people at different dilutions is very time consuming and costly. But it can be done. I will discuss this further under research needs since it is of major importance if public concerns re odor are ever going to be reduce or removed.

2.5 Research Needs

- I still feel there is more research needed on barn air quality as it affects animal physiology and health and worker health. Ernie Barber and Ken Blahy may have brought you up to date on these items. In general I feel that newer barns such as those by Elite are doing a good job. I know that there were still concerns expressed even for newer barn designs but I think great strides have been made.

- Odors from storages seem to be manageable if covers (straw or fabric) are used. The best management practices while using these covers will only come with experience. i.e. how to mix the storage before removing for land spreading, how to prevent or reduce possible cover movement during high winds, how to maintain a cover when straw is used if there are heavy rainfall events etc.
- Odors from barn air exhaust for new, well ventilated buildings has been reduced and I expect will not be a major problem. I believe current research is checking exhaust air quality of these barns.

- Odors generated from feedlots and cattle holding areas are possibly a lesser problem and very location specific. I just don't know whether this is a problem in Manitoba but if it is, I suspect that changes in management practices such as adding straw to keep manure dry or keeping holding areas dry etc could make the problem manageable. But, my information is limited.

- Method of measuring odors. People worried about odors from livestock operations probably will never accept what government and industry people say unless it is possible to actually measure odor intensity on site rapidly and with reproducible results. That

will require extensive work on odor measurement, on what is "acceptable" by people in the area and how acceptance is affected by such factors as odor duration (minutes, hours, days), frequency (three days in a row, weekly, twice a year for a couple of hours, etc.), source (swine vs poultry), etc. But more research is needed and is being carried out in

several labs in the USA, the Netherlands and at the University of Manitoba. As well, more odor measurement research is needed probably using the olfactometer or another odor measurement system for measuring how odors are reduced as a result of management changes or new treatment systems are tested. New odor treatment systems need to be evaluated, new management systems need to be tested re odor reduction (e.g. does the new ventilation systems reduce exhaust air odor by 90%?, or does twice a day flushing of manure gutters reduce odor levels from barn air by 25%, or does covering a storage reduce manure odor levels by 50% at the edge of the storage which results in a reduction of odor intensity at the property level by 90%). If we wish to develop new technology or management systems for odor control, a method must be available to determine the extent to which their use will reduce odor intensity and possibly quality.

2.6 Bottom Line

Better ventilation system design is reducing odors from barns, covering manure storages is reducing odors from storages and injecting or rapid cover of manured fields at time of application can and has significantly reduced odor levels from livestock operations but there is still a FEAR (and justifiable in many areas) of odors from hogs especially leading to the NIMBY syndrome. For new systems that have made every attempt to get odors under control, if they are effective, how does one get the information across to the public that they should be looking at what might result from the new operation and not what has occurred as a result of systems put in place 20 years ago?

3 Manure Management Practices

The information in the previous two sections outlines possible concerns related to possible changes in air and water quality as a result of an expansion. The information in those sections outlines the possible problems and I have tried to include changes in management practices based on good scientifically based information that will minimize the impacts. It should be noted, that it appears that most if not all of the significant expansion of the swine industry will be through larger operations with the latest in ventilation systems for barns, lined, covered manure storages and injection or rapid cover manure application systems. Most of the presentations and scientific evidence indicates that these operations will have good barn air quality, storage structures and manure application rates that will minimize the potential for groundwater contamination, and covered storages and manure application rates that will reduce odors. That doesn't address the problems with older small operations. If the older operations would even use the current recommended waste management practices, there would be a lot fewer problems and less concerns.

4. Monitoring and Information Systems

There is no question that better information would help in addressing many of the issues discussed.

Water quality and changing water quality for all fresh water systems (from Lake Winnipeg and its problems, to major rivers, to streams adjacent to farms, wells, to groundwater) would all be of help. The coordination of existing water quality data in all of its various forms and locations would be a first priority in my view. Better information on changes in water quality resulting form overland flow from agricultural lands would also be of great help in understanding long term effects of different agronomic practices. Are the groundwater hazard area maps too course for use for site specific farms? What is needed to make them useable when siting new facilities? Once the data has been made available, it should be possible to better direct resources at the points where information gaps have been identified. Groundwater maps and direction of flow, soil type and capability maps are needed. Location maps of where current livestock operations are located the number of animals and the amount of land that is associated with these production units for manure application are needed.

On a different note, it was pointed out that there is also a need for easy access to maps that show infrastructure for specific regions containing information about roads, hydro power, water available for farm use, local streams, rivers etc., even information on availability of trained farm workers.

All of the above were discussed but I have no real recommendations re how to incorporate them into the Panel's deliberations. There is no question there is an information shortage but that some of that information has been collected but has just not been made readily available.

5. Technical Note on the Nitrogen Cycle as it applies to Livestock Farms

The cycle, **very simplified,** is made up of the following steps:

- Atmospheric nitrogen is fixed into ammonia by nitrogen fixing bacteria in soil and associated with plant roots:

  $N_2 \rightarrow NH_3$ which in solution becomes NH_4^+
- Other soil bacteria then convert the ammonium ions to nitrite and then to nitrate ions:

  $NH_4^+ \rightarrow NO_2^- \rightarrow NO_3^-$
- Nitrate ions in the absence of oxygen are converted by bacteria back to nitrous oxide and then to nitrogen gas. $NO_3^- \rightarrow N_2O \rightarrow N_2$

5.1 Most significant interactions of the nitrogen cycle and livestock production and waste management

Animal feed contains nitrogen mainly in proteins and nucleic acids. The proteins are digested and become animal tissue. General physiological processes breakdown tissue releasing the nitrogen from the tissue as urea in urine. The faeces contains undigested nitrogen. The overall balance comes out that about for dairy, about 71% of all feed nitrogen is excreted in the urine and faeces and 29% leaves the farm in the milk and animal tissue. For swine about 60 of the feed nitrogen is excreted. And 40% is retained as animal tissue. For adult livestock, virtually all of the ingested nitrogen is excreted. i.e. no weight gain, no overall retention of nitrogen.

The nitrogen in the manure remains in the organic and ammonium forms as long as there is no oxygen present (manure storages). When applied to the land, the different forms of nitrogen meet an aerobic environment and soil bacteria convert ammonium ions to nitrite and then to nitrate nitrogen. If the temperature is low the process is slowed but will continue above freezing (not sure of the exact temperature cut off). The ammonium ions in the soil can be taken up by the plants directly but they are not readily mobile since they are adsorbed onto the surfaces of soil particles. I am told that the nitrate ions are preferred by plants over ammonium ions. They are taken up along with the water being used by the plant. The nitrogen taken up by the plants is converted into proteins and then removed from the land as feed for the livestock or exported from the site. Any nitrate ions that are not picked up by the plants will move with any water that is moving through the soil and eventually reach groundwater. In Manitoba, nitrate ions left in the soil at the end of the growing season will remain in the soil and be available to plants in the spring provided that the water moving through the soil from rains in the fall does not move the ions too far down in the soil before freeze up. If the soil becomes waterlogged during the summer, the rate of oxygen transfer into the soil can not keep up with the plant roots and soil organism demand for oxygen, and the soil becomes anaerobic. Under the anaerobic conditions, the soil bacteria looking for oxygen strip it from the nitrate ions and convert the nitrogen to nitrogen gas or one of the other oxides of nitrogen. This can represent a significant loss of nitrogen for the plant.

5.2 Other factors

- Storages: All manure in storage is in an anaerobic environment and thus no nitrate ions are present and nitrogen is in the form of ammonium ions and organic-N forms.

- Manure packs: Depending on the thickness of the pack, oxygen may penetrate the pack and nitrate ions can be formed and appear in the runoff or leachate from the pack.

- Biogas generator: Waste can undergo anaerobic digestion if properly managed and carbohydrates are converted to methane and carbon dioxide. In very simple terms, the gas is about 50% methane and 50% carbon dioxide. Actually about 60% methane to 40% carbon dioxide but not important here. Nitrogen is lost only if it escapes from the

digester and tends to be tied up in bacterial cell bodies. No phosphorus is lost from the digester. In essence this means that the waste whether it is held in storage or run through a digester will retain essentially the same amount of nitrogen and phosphorus and will require the same amount of land for application and crop production. Anaerobic

digestion does not reduce the land requirements for final application if both the liquid and solid fractions are going back to the land.

- Composting: If the manure is kept in an aerobic environment by frequent turning to allow oxygen penetration, the waste undergoes aerobic degradation with the biomass being converted to new cell bodies and carbon dioxide and water (same as we do). The nitrogen is converted to organic nitrogen and so after an initial loss of ammonia, nitrogen losses are reduced.

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